Socio-Economic Impact of Telehealth: Evidence Now for Health Care in the Future

Volume One: State of the Science Review

A report prepared by the
Health Telematics Unit,
University of Calgary

31 October 2002

Funded by the
Alberta Heritage Foundation for Medical Research
State of the Science Review Program

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I EXECUTIVE SUMMARY

Telehealth has become widespread in the last two decades, despite the generally poor scientific evidence available to support its use. This study was undertaken to contribute to the Alberta Heritage Foundation for Medical Research (AHFMR) 'State of the Science Reviews' program, and provides an information base to assist policy- and decision-makers, and researchers, in their deliberations about telehealth.

Telehealth, telemedicine, or e-health is defined as "the use of information and communication technology (ICT) to deliver health services, expertise and information over distance, geographic, time, social and cultural barriers." Telehealth encompasses Internet or web-based "e-health", as well as video-based applications. Applications can be real-time or store-and-forward.

This report summarizes the health services scientific literature on telehealth. Based upon a comprehensive literature search and a critical review and appraisal of that literature, the report provides an overview of the areas of strength and weakness in the telehealth research base, identifies gaps in the existing knowledge, and reviews policy implications. Specifically, this study addresses the following three research questions:

1. What is the socio-economic impact of telehealth as a method of delivery of healthcare and information, compared to that of the status quo? For patients and their families? For providers, programs, institutions and regional health authorities? At the provincial and national levels? For the public in general?
2. What are the optimal indicators and proxy indicators for the assessment of the impact of telehealth?
3. What are the related recommendations for policy and decision makers?

The report consists of three volumes. Volume One describes the general areas of health benefit supported by proven telehealth applications from the literature. Volume Two summarizes the related policy implications and recommendations, and Volume Three provides appendices that summarize the literature and support Volumes One and Two.

1. Socio-economic impact of telehealth

Telehealth has been found to offer important quality of life, health, and socio-economic benefits to the people of Alberta and Canada and to reduce costs and utilization of the healthcare system.

Based upon existing literature, a total of 14 social determinants of health or socio-economic performance indicators for a community were identified for this study. Of these, the study identified nine areas of socio-economic benefit as most prominent in the telehealth literature: Access, Cost / Cost Effectiveness / Decreased Health Services Utilization, Education, Support, Social Isolation, Acceptability / Satisfaction, Health Outcomes, Quality of Care, and Quality of Life. Ten subject areas, representing the most promising areas of telehealth application, were identified for study: Geriatrics, Paediatrics, First Nations, Telerehabilitation, Tele-mental health, Teleradiology, Rural / Remote, Tele-homecare, Renal, and Systematic Reviews of telehealth. Using only those studies that provided a 'strength of evidence' ranging from 'Good' to 'Fair', Table E1 highlights those subject areas within which these socio-economic benefits have been found within this evidence framework. It can be seen that Paediatrics and Tele-mental health offer the most socio-economic benefits, whereas Renal Dialysis appears to offer none. The use of telehealth for Renal Dialysis does offer socio-economic benefits, but, to date, the literature review did not offer adequate quality of evidence. This reveals a gap in our current research base that requires further attention.

The benefits summarized in Table E1 accrue to one or more of the public, patient, family, providers, programs, institutions, or regional health authorities, as well as to the healthcare system at provincial, territorial, and national levels.

Table E.1 Areas of Benefit of Telehealth Applications

Areas of Benefit:		1	2	3	4	5	6	7	8	9
Subject Area	*Number of studies providing Good to Fair evidence**	*Access*	*Cost / CE / Decreased health services utilization*	*Education*	*Support*	*Social Isolation*	*Acceptability / Satisfaction*	*Health Outcomes*	*Quality of Care*	*Quality of Life*
Geriatrics	16	8	6	3	4		6	3	2	
Paediatrics	24	3	9	1	3	1	2		3	3
First Nations	2			1						1
Telerehabilitation	5		2	1			2		1	3
Tele-Mental Health	16	2	2	3	3	1	2		3	1
Teleradiology	30	10	15					1	3	
Rural / Remote	7		1	1			4		1	1
Tele-Homecare	9	1	6				4		2	2
Renal	0									
Systematic Reviews	17	3	4				4	4	2	

* The five-point rating scale used included the following categories: Good, Good to Fair, Fair, Fair to Poor, and Poor, in terms of scientific evidence. The articles enumerated here rate between Good and Fair.

Twelve common themes emerged from the analysis, which together form the basis for recommendations that will ensure appropriate development of telehealth in the future.

- *A need exists for policy development.*
- *Policy leadership will greatly facilitate the use and integration of telehealth.*
- *Increased awareness and understanding of telehealth opportunities is needed.*
- *Increased connectivity to rural and remote communities is required.*
- *Many potential benefits exist for video consultation, including access, patient satisfaction, and cost savings.*
- *Strong evidence is lacking regarding the impact of telehealth on health services and human resource outcomes.*

- *Other than cost, access, satisfaction, and quality of life, extremely few true socio-economic indicators have been addressed.*
- *Telehealth provides benefits to patients and their families such as improved access to health services, avoidance of travel, and more rapid provision of care.*
- *There is an economic benefit in avoiding transfers to specialist centres and providing teleconsultations in some areas.*
- *Telehealth can save time for staff and save time data transfer.*
- *Telehealth can enhance educational opportunities for health care providers, patients, and families, improving clinical outcomes and reducing hospitalization.*
- *Simpler technology, such as the telephone, can be used successfully for patient assessment, triage, monitoring, reminders, or direct intervention, and can provide positive socio-economic benefit.*

2. Optimal indicators and proxy indicators

A variety of outcome measures have been documented in the literature (access, quality of life, satisfaction, cost), but no studies clearly identified or defined specific socio-economic indicators of outcome. At this time there is no agreement on which quantitative or qualitative measures (i.e. outcome indicators) are appropriate, or of most value, when evaluating telehealth applications. The 'areas of benefit' identified for this study are based upon accepted determinants of health, but these are not as yet reflected as formal indicators in the telehealth literature. This study found no consistency in the identification or application of such indicators within, or between, studies in any subject area. As a result there is uncertainty as to the general applicability of some study data, and direct comparison of one study with another may be misleading. This finding highlights a critical gap in our current research process and capabilities. Appropriately focused research questions and designs, validated instruments and defined quantitative or qualitative measures are required.

3. Recommendations for policy and decision makers

Based upon the evidence available, this study identified several general and subject specific recommendations. Subsequent review found them to be congruent or complementary to Alberta and Federal health reform initiatives described in anticipated (Romanow) and recent (Kirby;

Mazankowski) reports, each of which call for change and reform, not maintenance of the current structure.

Saskatchewan premier Roy Romanow will release his findings in late November, 2002 (Commission on the Future of Healthcare in Canada). One finding in an interim report was that Canadians living in rural or remote areas frequently feel that they lack sufficient access to health services. To address this inequity of service one solution was to make "greater use of telemedicine and information technologies". The Interim report also leaned toward a recommendation for developing a national homecare strategy, noting that "supporters of a national approach suggest that enabling patients to receive more treatment at home will improve quality of care, relieve pressure on hospitals, and result in significant savings". Such a solution would be facilitated by telehealth.

Senator Michael Kirby's 11-member committee recently released the first of two major studies of the healthcare system in Canada. This report identifies securing timely access to care as being critical, along with the need for investment in health information technology. Also, one recommendation from this report is that post-acute homecare and palliative homecare be expanded, two areas where telehealth has been demonstrated as valuable.

The recent Report of the Premier's Advisory Council on Health (Mazankowski Report) provides a framework for reforming Alberta's health system. A review of the recommendations described in this report show many areas in which telehealth will have an impact. It is notable that of the 10 recommendations for reform, eight contain some element or specific recommendation related to telehealth or have relevance to telehealth policy. Examples include: providing Albertans with better information about how to stay healthy; reducing waiting times by introducing centralized booking, and posting waiting times for selected procedures on a website; investing in technology and establishing an electronic health record (EHR); providing long term funding for technology and information technology systems; continuing to support research, evidence-based decision making, and continuing Alberta's role as a leading centre of health and medical research. Little is said about policy, other than to note that some health decisions "… are not necessarily guided by the best information, but are instead made for a variety of reasons including past experience, expediency, political influences, or to comply with the wishes of health professionals or other health organizations". This underscores the importance and value of well-conceived policy.

General recommendations arising from this study are:

*A. **Policy***

1. To be successful and sustainable, telehealth must be fully integrated into existing health structures and processes in a practical and policy manner.
2. Integration can be achieved through aligning telehealth initiatives with existing strategic health plans, policy goal-setting, accompanying action steps, and attention to policy barriers.
3. Establishment of a policy forum that focuses on telehealth policy would facilitate these needs.
4. Telehealth applications should incorporate capacity for education, research, and administrative functions, as well as health and clinical functions.

*B. **Technology***

5. To facilitate access to many bandwidth intensive telehealth applications increased broadband connectivity is needed, particularly to rural and remote communities.
6. Given the evidence, the use of telephone-based telehealth applications should be re-examined.
7. Technology modalities (broadband, narrowband, web-based) and applications (videoconferencing, data monitoring, telephone) should be viewed as synergistic, not competitive, and the most appropriate tool applied; i.e., hybrid connectivity solutions are recommended.

*C. **Evaluation***

8. Suitable outcome indicators, measures, and reliable and valid instruments for socio-economic benefit of telehealth must be identified, defined, and consistently applied within a recognized evaluation framework that asks relevant research questions.

9. Suitable frameworks for economic analysis need to be developed that capture non-monetary and unintended consequences, as well as monetary measures.

10. Telehealth programs should be implemented and evaluated in a culturally aware and culturally sensitive manner.

11. Evaluations should include examination of the social, organizational, and policy aspects of telehealth.

D. Economic

12. Telehealth demonstrates sufficient evidence of socio-economic benefit to indicate ongoing investment is appropriate.

13. Sustainable telehealth 'programs' and not 'projects' should be targeted.

14. Full integration of telehealth will increase its use and decrease the per contact episode cost.

15. Investment in information and communications technology infostructure should be considered as an investment not only in health, but in business, education, and other e-sectors.

E. Investment Opportunities

16. R & D and economic development opportunities require pursuit.

Subject-specific recommendations arising from this study are as follows:

Paediatric Telehealth

17. Telehealth programs that improve quality of care and offer economic benefit for 'at risk' paediatric populations (e.g., neonates, adolescent asthmatics) should be introduced.

18. Evidence would suggest decision makers should consider telehealth to achieve enhanced social environments for children, and staff efficiencies as related to data transfer.

19. The use of low-cost technology solutions (e.g., the telephone) is strongly recommended for Paediatric telehealth where appropriate.

Geriatric Telehealth

20. Telehealth programs should be used to support palliative home care initiatives.
21. Remote, wireless monitoring (e.g., personal alerts, caregiver and patient support, 'smart' homes and clothing) should be investigated for both enhanced independent living and geriatric healthcare applications.
22. Geriatric telehealth applications should be strongly considered as a technology R & D and economic development opportunity.
23. The use of e-prescription applications should be used to increase self-efficacy and compliance, and to reduce adverse effects.
24. The use of low-cost technology solutions (e.g., the telephone) is strongly recommended for Geriatric telehealth where appropriate.

First Nations Telehealth

25. The recommendations provided in the Health Transition Fund project report of 2001 should be implemented, viz:
    - ➢ Increase connectivity to rural and remote communities, and especially Aboriginal communities;
    - ➢ Undertake new research further to implementation of successful telehealth initiatives in First Nations and Inuit communities, and regarding the impact of telehealth on costs, health services and human resources;
    - ➢ Promote equality of opportunity for telehealth across First Nations and Inuit communities;
    - ➢ Increase awareness and understanding of telehealth opportunities among First Nations and Inuit stakeholders;

- Create linkages between telehealth and other initiatives of the Aboriginal Health Infostructure in order to leverage investments.

26. Health services and information content should be delivered in a culturally sensitive context.

Tele-homecare

27. Telehealth should be considered for application in managing and monitoring chronic heart failure, chronic obstructive pulmonary disease, oncology, diabetes, wound care, asthma, anxiety, and cardiac vascular accident.

28. Home Telehealth programs should be used to assist with and transform the mode of delivery of home care. Such programs should be used to support change within the context of the continuum of care, and a comprehensive home healthcare program.

Tele-mental health

29. Tele-mental health, a proven and sustainable telehealth application, should be expanded.

30. The use of low-cost technology solutions (e.g., the telephone) is strongly recommended for tele-mental health where appropriate.

Teleradiology

31. Teleradiology, a proven and sustainable telehealth application in settings of appropriate workload and distance, should be expanded.

32. Teleradiology should be adopted in settings where the need to travel or poor speed of care provision present barriers to access.

Renal Dialysis Telehealth

33. Teledialysis should be evaluated more comprehensively before commitment is made.

Rural and Remote Telehealth

34. Increased access to a broad range of clinical and educational resources should be provided to rural, remote, and underserved populations.

35. Enhanced connectivity to rural and remote communities and residences should be a priority to improve economies of scale in future service and information delivery.

Telerehabilitation

36. Telerehabilitation, which has been demonstrated to show benefits for health care and patients (e.g., speech pathology, transtelephonic exercise monitoring) requires more comprehensive economic analysis.

Conclusions

Overall, valuable data and levels of evidence exist that support telehealth, and that can now be used by policy makers, decision makers, and researchers when making decisions specific to telehealth. These have been summarised in this report. However, evidence of high scientific quality for telehealth applications is still lacking. What has been clearly demonstrated is the feasibility of using telehealth in many clinical areas and for many health, clinical, educational, research, and administrative activities. Many of the same policy and research concerns, issues, and challenges in telehealth that are discussed in current sources existed 10 years ago. These issues should be addressed and decisions made.

Successful and sustainable implementation of telehealth exists when there is greater integration with other e-health initiatives, policy goal-setting, accompanying action steps, and attention to policy barriers. Benefits and successes often result when strategies and planning adopt human resource and user frameworks. For example, health and medical workforce and workflow are issues, together with readiness and ethical considerations. Collaboration, partnership and sharing are central to the advancement and sustainability of telehealth and its potential benefits, as are needs identification, risk assessment, enabling policy, and true public involvement.

Although project findings to date show broad benefits, these are generally associated with feasibility activity, and seldom measure the impact of telehealth on the social determinants of health, for example, poverty, social isolation, independent living, and identified needs of special populations. New evaluation and research activities should employ methodologies which enable the study of such factors. The reviewed literature suggests that the principle driving forces for telehealth have been financial, specialist clinical interest, and proof of technological feasibility. Patients' views and interests, social effects, quality controls and wider organizational effects are seldom considered. Our study shows that there are a growing number of evaluation frameworks for use by policy- and decision-makers when developing accepted evaluation approaches that could be consistently applied; for example, generic evaluation frameworks, benefit-cost analysis and consumer care pattern guidelines, as well as effects-oriented and risk analysis frameworks. These have been provided.

II INTRODUCTION

Telehealth has become widespread in the last two decades, despite the generally poor scientific evidence available to support its use. This study was undertaken to contribute to the Alberta Heritage Foundation for Medical Research (AHFMR) 'State of the Science Reviews' program, and provides an information base to assist policy- and decision-makers, and researchers, in their deliberations about telehealth.

Telehealth has been found to offer important quality of life, health and socio-economic benefits to the people of Alberta and Canada, and can reduce costs and utilization in the health system. This study describes the kinds of benefits that can be achieved and how. Specifically, this study addresses the following three research questions:

1. What is the socio-economic impact of telehealth as a method of delivery of healthcare and information, compared to that of the status quo? For patients and their families? For providers, programs, institutions and regional health authorities? At the provincial and national levels? For the public in general?
2. What are the optimal indicators and proxy indicators for the assessment of the impact of telehealth?
3. What are the related recommendations for policy and decision makers?

Telehealth, telemedicine, or e-health is defined as "the use of information and communication technology (ICT) to deliver health services, expertise and information over distance, geographic, time, social and cultural barriers"(Reid, 1996). Telehealth encompasses Internet or web-based "e-health", as well as video-based applications. Applications can be real-time or store-and-forward.

Socio-economic indicators include social determinants of health: poverty, social isolation, education, life stress, early life, access to transport, nutrition, access to health services and care, and factors affecting the socio-economic performance of a community: economy, labour markets, innovation, environment, education, health.

The context for this study is the Canadian health care environment with its particular characteristics, including universal access to health care, a population that is aging, widely dispersed (rural / remote), and diverse in composition with varying health needs (e.g., First Nations). Also implied in the study context is consideration of current strategic policy directions in the Albertan/Canadian health sector, such as the principles of providing care at the right time in the right place by the right provider, maintaining individuals' independence and community living, providing consumer choice, and trialling innovative projects in service delivery. These concepts, as well as the study investigators' experience and informed opinion regarding areas of promise for telehealth, led to the development of ten subject areas of focus for this study. These are:

1. Paediatrics telehealth
2. Geriatrics telehealth
3. First Nations telehealth
4. Tele-homecare
5. Tele-mental health
6. Teleradiology
7. Renal dialysis telehealth
8. Rural and remote telehealth
9. Telerehabilitation
10. Telehealth Reviews

A systematic review of the literature in each of these areas was undertaken, as well as a formal economic analysis of all pertinent articles within each subject area. In addition, a review of policy-related articles and sources was completed.

The study consists of three volumes:

Volume One: State of the Science Review. The State of the Science Review contains a summary of recommendations drawn from both reports, a description of the literature search strategy and the process established for selecting and reviewing sources, and a thorough analysis of the literature in each of the subject areas. It also includes an economic analysis, organized and summarized by subject area.

Volume Two: Policy Report. This report includes a summary of recommendations drawn from both reports, a summary of the results of the State of the Science Review, a description of the policy development process (awareness and engagement process as well as the review process for the policy articles/sources), and results of the policy review.

Volume Three: Appendices. This volume contains four issues of appendices supporting Volumes One and Two. The appendices include detailed information about the study process and a systematic review of all articles in each subject area, as well as all economic- and policy-related articles included in this study.

III RECOMMENDATIONS

General recommendations arising from this study are:

A. Policy

1. To be successful and sustainable, telehealth must be fully integrated into existing health structures and processes in a practical and policy manner.
2. Integration can be achieved through aligning telehealth initiatives with existing strategic health plans, policy goal-setting, accompanying action steps, and attention to policy barriers.
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9. Suitable frameworks for economic analysis need to be developed that capture non-monetary and unintended consequences, as well as monetary measures.
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12. Telehealth demonstrates sufficient evidence of socio-economic benefit to indicate ongoing investment is appropriate.

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32. Teleradiology should be adopted in settings where the need to travel or poor speed of care provision present barriers to access.

Renal Dialysis Telehealth

33. Teledialysis should be evaluated more comprehensively before commitment is made.

Rural and Remote Telehealth

34. Increased access to a broad range of clinical and educational resources should be provided to rural, remote, and underserved populations.

35. Enhanced connectivity to rural and remote communities and residences should be a priority to improve economies of scale in future service and information delivery.

Telerehabilitation

36. Telerehabilitation, which has been demonstrated to show benefits for health care and patients (e.g., speech pathology, transtelephonic exercise monitoring) requires more comprehensive economic analysis.

IV LITERATURE SEARCH STRATEGY

The literature search strategy was led by the project librarian, in consultation with the other project team members. The literature search encompassed both peer-reviewed journals and the grey literature. Electronic database searching, communication with experts in the field, hand-searching of conference proceedings, along with Internet searches targeting individual organization and government web sites were among the key approaches used to identify literature relevant to this study.

The search strategy incorporated the following elements:

A. Electronic database searches

Subject and text words used in searching databases, as well as databases searched, are listed in Appendix B, pp. 1-7. Limits applied to searches were:

1. Language limits: eliminate Asian languages but retrieve all other non-English articles that include English language abstracts.
2. Publication date from 1980 to present

Studies captured in the preliminary database search results:

- case reports
- clinical trials
- comparative studies
- costing studies
- descriptive studies
- evaluation studies
- meta-analyses
- program evaluations
- qualitative studies
- randomized controlled trials
- systematic reviews
- validation studies

Studies excluded from preliminary database search results:

- editorials
- letters
- think pieces
- general/non-academic overviews

B. Hand searches

Appendix B (p. 12) contains a list of key journals in the field of telehealth and relevant conference proceedings that were hand-searched. Up to five years of back issues were searched.

C. Internet searches

Key organization and government web sites were searched as listed in Appendix B, pp. 13-14. Free text Internet searches were also undertaken, using the Google and Copernic search engines along with the main search terms listed in Appendix B, p. 1.

D. Reference lists

Reference lists of key journal articles were scanned to identify further studies of interest.

E. Consultation with investigators

Team investigators were able to identify, through previous research and consultation with colleagues, additional articles and reports relevant to the study.

F. Refinements on Initial Database Search Results

From the initial search results and information gleaned from government reports on identified health care priorities in Alberta and Canada, it was decided to focus on these aspects of telehealth:

1. Children/Paediatrics
2. First Nations
3. Geriatrics (Homecare, Mental Health, Pharmacy)
4. Homecare
5. Mental Health
6. Radiology
7. Renal Dialysis
8. Rural & Remote
9. Rehabilitation
10. Ultrasound

Additional searching of existing results was done to locate subsets of the publications in these categories. Lists of search terms for each of the above categories are provided in Appendix B (pp. 8-11).

V STATE OF THE SCIENCE REVIEW PROCESS

i. Abstract Review Process

Abstracts identified through the search strategy were entered in Reference Manager and were grouped into ten subject areas:

- Paediatric telehealth
- First Nations telehealth
- Geriatric telehealth
- Tele-homecare
- Tele-mental health
- Teleradiology and Tele-ultrasound
- Renal Dialysis telehealth
- Rural & Remote telehealth
- Telerehabilitation

It was decided that the subject areas of teleradiology and tele-ultrasound would be combined (due to the relatively low number of tele-ultrasound studies), bringing the total number of subject areas to twelve. From this point forward, reference to teleradiology incorporates tele-ultrasound.

Some abstracts fell into more than one category, for instance, articles pertaining to both First Nations and Rural & Remote telehealth. The abstracts were distributed amongst three study investigators. Investigators reviewed abstracts and designated each as 'in', 'out' or 'uncertain', based on the following considerations:

1. The study is actually about telehealth.
2. There is comparison of telehealth with non-telehealth.
3. The study includes consideration of at least one of the issues in the list outlined in the study proposal:

Social Determinants of Health	Socio-economic performance of a community
• poverty • social isolation • education • life stress • early life • access to transport • nutrition • access to health services and care	• economy • labour markets • innovation • environment • education • health

4. Abstracts which contained no details (might be title only), were included for selection if there was uncertainty about whether appropriate for the study.

Abstract citations designated as 'in' or 'uncertain' were returned to the main office where they were ordered, retrieved, and sent to the investigators. During this process, three additional areas for analysis were identified:

- Telehealth reviews
- Telehealth policy
- Economic analysis of telehealth

Responsibility for the reviews, policy and economic analyses was assigned to two other study investigators. Sources pertaining to these areas were identified by the first three investigators upon review of abstracts and were referred on through the main office to the other two investigators.

Table 1 outlines the investigator responsible for each identified subject area and for the policy and economic analyses, as well as the total number of abstracts reviewed.

Table 1 State of the Science Telehealth Subject areas, Policy and Economic Analysis

Categories: Subject areas 1 to 10, and Policy and Economic Analysis*	**Investigator Responsible**	**Number of abstracts located in the search**	**Final number of articles / sources included**
1. Paediatric telehealth	Dr. D. Hailey	577	24
2. First Nations telehealth	Dr. R. Thomas	43	8
3. Geriatric telehealth	Dr. R. Thomas	1106	53
4. Tele-homecare	Dr. R. Scott	479	63
5. Tele-mental health	Dr. D. Hailey	461	16
6. Teleradiology	Dr. D. Hailey	493	27
7. Renal dialysis telehealth	Dr. R. Scott	80	12
8. Rural & Remote telehealth	Dr. R. Scott	1051	35
9. Telerehabilitation	Dr. R. Thomas	117	23
10. Telehealth Reviews	C. Anderson	124	29
Telehealth Policy	C. Anderson	74	59
Economic Analysis of telehealth	Dr. A. Ohinmaa	41	41
Total		4646	306**

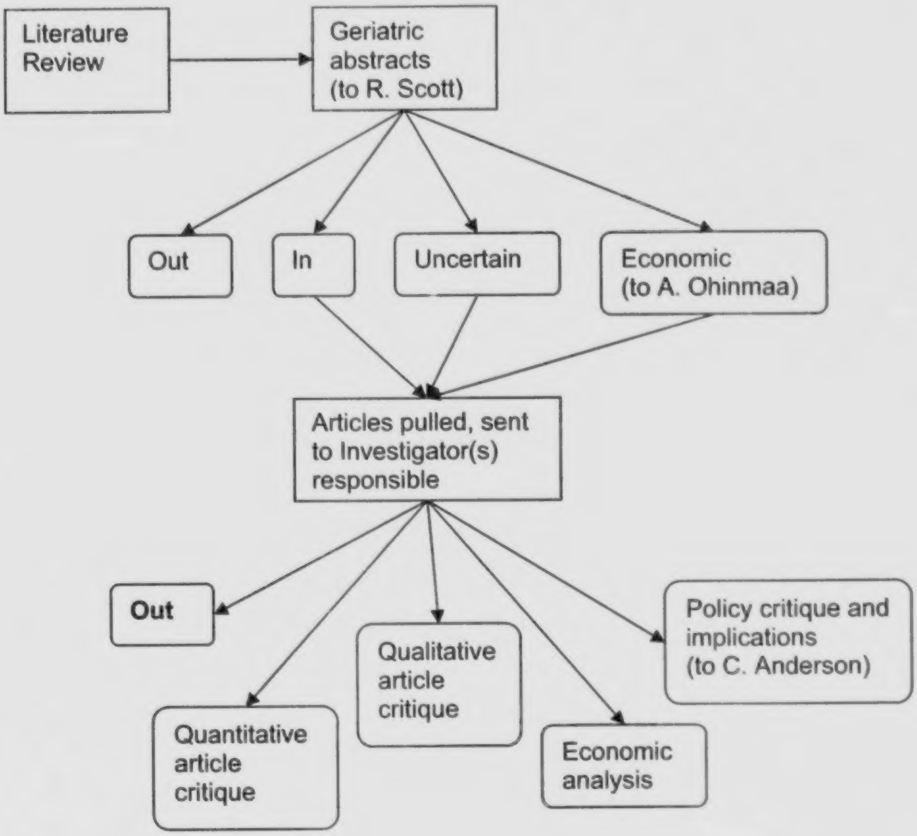
* These 12 categories are not mutually exclusive, i.e., one study could be counted in more than one category.

** The total number of sources included does not equal the sum from the twelve categories because some articles were reviewed in more than one subject area.

The review process is illustrated with the example of geriatric telehealth in Diagram 1.

Diagram 1: Process for Abstract review and Critique

Example: Geriatric telehealth review


Literature Review
Geriatric abstracts (to R. Scott)
Out
In
Uncertain
Economic (to A. Ohinmaa)
Articles pulled, sent to Investigator(s) responsible
Out
Quantitative article critique
Qualitative article critique
Economic analysis
Policy critique and implications (to C. Anderson)

ii. Critique of Articles: Process

As investigators received the articles and sources that they had ordered, they classified these sources as quantitative or qualitative. If sources were economic- or policy-related, investigators referred these through the central office to the other investigators responsible for Economic Analysis and Policy.

Quantitative Research Critique

Quantitative articles were selected for inclusion in the final report if they contained Good to Fair evidence based on study design and research methodology as outlined in the 1995 Jovell/Navarro-Rubio scale (Hailey et al, 2002). Good to Fair evidence comprises categories I through VII in Table 2.

Table 2 Levels of scientific evidence

Level: highest (I) to lowest (IX)	Strength of evidence	Type of study design	Conditions of scientific rigour*
I	Good	Meta-analysis of randomized controlled trials	Analysis of individual patient data Meta-regression Different techniques of analysis Absence of heterogeneity Quality of the studies
II		Large-sample randomized controlled trials	Assessment of statistical power Multicentre trial Quality of the study
III	Good to fair	Small-sample randomized controlled trials	Assessment of statistical power Quality of the study
IV		Non-randomized controlled prospective trials	Concurrent controls Multicentre trial Quality of the study
V		Non-randomized controlled retrospective trials	Historical controls Quality of the study
VI	Fair	Cohort studies	Concurrent controls Multicentre study Quality of the study
VII		Case-control studies	Multicentre study Quality of the study
VIII	Poor	Non-controlled clinical series Descriptive studies: surveillance of disease, surveys, registers, databases, prevalence studies Expert committees, consensus conferences	Multicentre study
IX		Anecdotes or case reports	

* Quality of the study as assessed by specific protocols and conditions of scientific rigour.
Source: Derived from Jovell and Navarro-Rubio (1995)
(Hailey et al, 2002)

If a source did not contain good-fair evidence, it may still have been included in the final report for comment if it contained important information related to socio-economic determinants of health or socio-economic indicators. This determination was made based on the expert opinion of the study investigators.

Exclusions

a) Non-comparative studies with no reference to social determinants of health or socio-economic indicators
b) Studies that were concerned only with equipment or other technical evaluation
c) Studies where there was substantial doubt regarding scientific validity

All quantitative articles that were included were analyzed and the following data abstracted and charted (based on the Cochrane Collaboration Review Manager software; website: http://www.cochrane-net.org/revman/):

- Article / Title / Author / Year / Country / Location
- Purpose/ Objectives
- Design
- Analysis
- Participants: age / gender/ groups
- Intervention / Duration
- Follow-up: sample size; dropout
- Outcomes / Socio-Economic Indicators
- Methodological Problems
- Policy Recommendations
- Applicability to Alberta

Qualitative Research Critique

Qualitative research in the area of telehealth is valuable because it asks questions that quantitative research may or cannot answer, such as those related to readiness or processes. Qualitative methodologies have the ability to explain complex themes, and to allow consideration of a wide range of interrelationships among historical events and social structures over multiple domains (Trauth, 2001).

There were twelve qualitative articles found for the project. These articles were pulled from their respective topic areas and reviewed independently. The following data from each article was abstracted and charted (based on the Cochrane Collaboration Review Manager software; website: http://www.cochrane-net.org/revman/):

- Article / Title / Author / Year / Country / Location
- Purpose/ Objectives
- Design
- Analysis
- Participants: age / gender/ groups
- Intervention / Duration
- Follow-up: sample size; dropout
- Outcomes / Socio-Economic Indicators
- Methodological Problems
- Policy Recommendations
- Applicability to Alberta

The analysis of the selected qualitative studies can be found in Appendix Q – Critique Qualitative.

The criteria used by the reviewers to rate the quality of the articles were:

1. *Dependability:* The question of sampling is paramount. Did the sample include the full range of possible cases or settings so that conceptual rather than statistical generalizations can be made? A sample size of 30 or greater is recommended in order to generate a full rage of cases (Stebbins, 2001).
2. *Credibility:* Did the researchers acknowledge the issue of validity, and if so, how was it dealt with? Triangulation of method, where more than one kind of data source is looked at, is one way of addressing concerns of validity.
3. *Transferability:* This concept deals with theory development, and whether the knowledge can be transferred to others. Were the research questions clearly set out, and did the conclusions address those questions?

Based on the above criteria, five articles were rated as good in quality (Carroll et al, 2001; Franken et al, 1996; Whitten et al, 2001), one was rated as fair (Gallienne et al, 1993), and the final six articles were rated as poor (Dansky et al, 1999; Hanson, 2000; Magnusson et al, 1997; Tually et al, 2001; Whitten et al, 1997).

Economic Analysis Critique

The Drummond et al (1997) criteria were used to critique economic analyses. These criteria consist of the following considerations:

1. Was a well-defined question posed in answerable form?
2. Was a comprehensive description of the competing alternatives given?
3. Was the effectiveness of the programs or services established?
4. Were all the important and relevant costs and consequences for each of the alternatives identified?
5. Were costs and consequences measured accurately in appropriate physical units?
6. Were costs and consequences valued credibly?
7. Were costs and consequences adjusted for different timing?
8. Was an incremental analysis of the costs and consequences of the alternatives performed?
9. Was allowance made for uncertainty in the estimates of costs and consequences?
10. Did the presentation and discussion of the study results include all issues of concern to users?

iii. Strengths and Limitations of this Study

The primary strength of the study was the varied and extensive expertise and experience of the project team, which consisted of the principle investigator and five other investigators, a research librarian, a local policy team of eight telehealth, information and communications technology (ICT), public health, and epidemiology researchers, policy leaders and strategists; as well as project managers and assistants. The list of project team members, their titles and qualifications, can be found in Appendix A: Project Team Members, Advisors and Assistants.

Midway through the project (Summer, 2002), a Policy Working Group, consisting of federal/provincial/territorial policy- and decision-makers, was identified through key contact referrals. This group was made aware of the study, its purpose and objectives, and many of these individuals provided valuable contributions in terms of policy implications and interpretation, and development of the results framework.

A comprehensive and exhaustive literature search enabled the team to identify a consummate body of literature related to the two key subjects of the study: 1) e-health / telehealth and 2) Social Determinants of Health / socio-economic indicators. Clearly outlined research questions and review processes enabled the effective progression of the study.

There are three limitations to this study which should be mentioned. Firstly, State of the Science Program limitations precluded the ability to have two reviewers assess each paper in this study. Once abstracts were grouped by subject area (i.e., Paediatrics, telerehabilitation, etc.), the subject areas were divided amongst five investigators and the task of selecting and reviewing articles relied upon the individual expertise and experience of one of five investigators. To mitigate any potential differences in selection and review processes, criteria were developed and the team met regularly to review progress and to discuss and resolve particular issues or concerns.

The second limitation of the study is that systematic reviews could not be assessed for strength of evidence as no rating system was available. The search strategy for telehealth review sources identified both systematic reviews and literature reviews, which are differentiated within the reviews analysis. A paper can be called a systematic review if it satisfies certain criteria, such as clear research question and associated transparent search strategy, and inclusion/exclusion criteria.

The subject areas identified for this study represent promising areas for telehealth application based on current health needs and initiatives and recognized health system priorities. Evidence pertaining to each subject area and ensuing recommendations cannot be generalized across subject areas or to the population as a whole, which may be seen as a limitation. For instance, evidence and recommendations related to a medical condition in Geriatrics cannot be applied to the same medical condition in adults. Wherever evidence or recommendations have been provided which relate to a particular population group, this has been specified.

VI STATE OF THE SCIENCE RESULTS

Chapter 1: Paediatric Telehealth

Highlights

- Telehealth is shown to improve quality of care for adolescents with asthma. Telephone reminder messages improved quality of care with respect to immunization.
- For neonatal intensive care, evidence was found for improved efficiency, quality, and possible stress reduction through use of telehealth. There is an economic benefit in avoiding transfers of neonates to specialist centres.
- Telehealth can achieve time savings for staff and time savings in data transfer.
- A study of social environment described how an interactive computer network decreased feeling of loneliness for sick children.
- Cost savings can be achieved for Paediatric consultations via telehealth.

Statistics on the literature

From the literature, 11 abstracts were identified that appeared to describe randomized controlled trials (RCTs) in Paediatrics, all of which were selected for further review. Of these 5 were subsequently excluded (one very small RCT which was no more than a feasibility study, an abstract with insufficient details, a study that used non-comparative self-reported outcomes and two studies on high risk pregnancy populations). Six studies were selected and data abstracted; five of these were RCTs and one a Delphi study.

A total of 142 abstracts related to non-randomized studies were identified of which 76 were selected for further review. Of 71 papers reviewed, 18 were selected for analysis and 55 were rejected (two of these duplicates in the data base). Brief reference is made to seven of the rejected studies, which contained material that is worth considering in reviewing the place of telemedicine in Paediatrics.

Refer to Appendix E – Critique Paediatrics for analysis of the 24 included studies.

Location and applicability of studies

Nineteen of the 24 studies were from the USA, there were two from Canada and one each from Greece, Iceland and the UK.

Of the 24 studies, 15 gave results that seem generally applicable to Alberta. A further five studies had some aspects that were applicable and four others did not seem to be applicable to Alberta.

Areas of application

The general areas covered by the selected studies are shown in Table 1.1. Studies dealing with cardiology applications were the most common, and included five from the same research group in North Carolina. Three of those studies also specifically relate to neonatal intensive care (NICU).

Table 1. 1 Areas of study for Paediatric applications

Area of study	RCTs	Non-RCTs
Management of asthma	1	
Immunisation rates	2	
NICU	1	
Emergency room		2
Difficult infants/ maternal distress	1	
Cardiology		13
Social environment for sick children		1
After hours referral triage		2
General consultations		1
School-Based		1

Paediatric applications and Social Determinants of Health

Indications from the papers that were analyzed are summarized below. Results from both RCTs and non-randomized studies are discussed.

Management of asthma

Bynum et al (2000) provide reasonable evidence of improved quality of health care in a rural adolescent population.

Immunisation rates

There is good evidence that telephone reminder messages increased quality of care and access to appropriate intervention in a rural US population; apparently also good support for such an approach in a Health Maintenance Organization (HMO) population, but some details of the study are not available (Lieu et al, 1998; Dini et al, 1995).

Neonatal intensive care

Gray et al (2000) provide reasonable evidence of improved efficiency (though cost data are not given), quality and possible stress reduction in a US population.

Emergency room

A telephone triage system for screening referrals to a US hospital attempted to improve quality and efficiency of health care, but the evidence is relatively poor (Barber et al, 2000 – Delphi study). An observational study by Kallis et al (1999) gives a weak indication of the effectiveness of a POTS (plain old telephone service) approach to assigning primary care providers to ER patients.

These studies do not convincingly demonstrate effects on social determinants of health in this area of Paediatric management.

Difficult infants

Thome et al (1999) provide good evidence that telephone-based intervention reduced maternal fatigue but not parental stress.

Cardiology

Twelve non-randomized studies deal with the use of Paediatric echocardiography and provide evidence of benefits from this type of application. This is consistent with the conclusions of an earlier systematic review (Ohinmaa et al., 1999) which identified transmission of echocardiographic images as one of the telehealth areas for which there was some convincing evidence of effectiveness. Five of the studies are from a group in North Carolina, USA.

Five of the studies, from different centres, draw attention to benefits through avoiding transfer of neonates to specialist centres. The North Carolina group found a 58% reduction in such transfers following the introduction of tele-echocardiography (Rendina et al, 2001). The other studies (Mulholland et al, 1999; Sable et al, 1999; Finley et al, 1997; Tsilimigaki et al, 2001) provide some indication of transfers avoided and related cost benefits, though there is no rigorous analysis. The paper by Tsilimigaki et al (2001) notes the social benefits from a tele-echocardiography service for a community that is remote from specialist services.

A related paper by Sable et al (2002) found evidence of time savings for staff and Mehta et al (2001) demonstrated time savings in transfer of data and consequent action, as compared with courier services.

Three of the studies by Rendina et al (1997, 1998, 2001) examine the association between introduction of tele-echocardiography and length of stay (LOS) in neonatal intensive care. There was an indication of a reduction in LOS (not statistically significant) for a small group of neonates and stronger evidence of a reduction in stay for very low birth weight infants. A further study found no evidence of telemedicine having an effect on utilization of respiratory therapy. The study by Scholz et al (1999) on ordering patterns suggested higher use of echocardiographic tests by community physicians than by cardiologists, perhaps suggesting the potential for inappropriate use.

The remaining cardiology paper dealt with monitoring of Paediatric patients who had received a pacemaker, but does no more than indicate feasibility.

Social environment for sick children

The paper by Battles et al (2002) describes the use of an interactive computer network by children with life threatening diseases who were being treated by a major hospital. Children and their parents reported reduced feelings of loneliness and greater willingness to return to hospital for further treatment.

After hours referral triage

Two studies dealt with use of POTS-based systems to triage requests for advice and services and showed decreased rates of referral without adverse effects.

General consultations

A paper by Dick et al (1999) gave indications of cost savings to families through use of telemedicine for Paediatric consultations.

School-Based

A qualitative paper by Whitten et al (2000) describes the use of telemedicine in schools. The perception of nurses identified more problems than benefits, but most responses centered on positive, rather than negative aspects of the project. For instance, school administrators felt that an important aspect of the project was that the children saw a physician.

General areas of benefit for which there was reasonably convincing evidence are summarized in Table 1.2. There was one example of a potential reduction in efficiency of services and one where there was no effect on stress.

Table 1.2 Areas of benefits from Paediatric studies

Area	Number of studies*
Quality of health	1
Quality of care	3
Reduction in transfer of patients	5
Efficiency of services	5
Reduction in hospital LOS	3
Reduction in stress or fatigue	3
Reduction in feelings of loneliness	1
Reduced travel cost for families	1

* Some studies considered more than one of these areas

Comment on selected non-comparative studies

Seven studies were located that appeared to provide useful descriptions of telehealth programs in Paediatric applications, while not having sufficient comparative information for analysis. In some of these, successful changes from baseline health measurements were demonstrated through implementation of a telemedicine program but there was no adequate comparison with a non-telehealth alternative. The topics covered in these studies were management of asthma, school-based telehealth, management of diabetes, special health care needs, speech therapy and surgery consultations. They suggest further areas of benefit in Paediatric applications of telemedicine.

Summary of Economic Analysis for Paediatrics

(For full details refer to Chapter 11: Economic Analysis.)

The economics of Paediatric telehealth applications was analyzed mainly from a health care provider or patient/parental perspective. From the health care perspective, the cardiologic consultations seem to be cost saving (at least after certain workload), partly because the investment cost to the system is not high, and the costs of transporting and caring for neonates in intensive care units are very high. From the patients/parents perspective, Paediatric specialist and Paediatric congenital heart disease consultations can be cost-saving for patients' families.

The quality of the economic studies was poor, since the studies fulfilled only 0 to 3 quality criteria. This means that although the results can give some initial information about the magnitude of the costs and possible cost savings, the results cannot be fully used in actual decision-making due to the likely bias of results in both directions.

Chapter 2: Geriatric Telehealth

Highlights

- The telephone can be used for patient assessment, monitoring (with decision support), education, reminder calls, or treatment. Benefits include reduced hospitalization rates, improved patient satisfaction with care, increased medication and exercise compliance, and improved patient outcomes (e.g., depression, hypertension).
- Personal alert systems can result in reduced rates of hospitalization.
- Support for caregivers can be provided by an electronic network with information, decision support and communication capacities.
- There are many identified potential benefits of video consultation, including access, patient satisfaction and cost savings.
- Telehealth can enhance quality of life for elderly people and people with mobility problems (especially those living alone) by providing an increased ability to live independently and increased sense of security.
- Education can be provided via telehealth; for instance, regarding medication interactions. Demonstrated results include increased patient self-efficacy with respect to medication use, and reduced adverse effects.

Statistics on the literature

A total of 1106 articles and other sources which appeared to be related to geriatric telehealth were identified in the literature search. Upon review of abstracts, 79 articles were selected for further review. Twenty-six were subsequently excluded for the following reasons:

(a) the articles did not pertain to telehealth or
(b) the articles were descriptive and related to telehealth but contained no scientific evidence and no reference to socio-economic issues or indicators.

The 53 articles selected for analysis included 14 RCTs and 39 non-RCTs. Three of the RCTs were considered to provide poor scientific evidence based on study design and methodology. Five of the non-RCTs were well-designed comparative studies (e.g., non-randomized controlled trials, cohort studies, case control studies) and are included with 11 RCTs in the section describing good-fair scientific evidence (total 16 studies). There were a total of 37 non-comparative studies included for comment regarding socio-economic indicators.

Full analysis of the 53 included studies can be found in Appendix F – Critique Geriatrics.

Areas of application and Location of studies

The areas of study of the 16 Geriatrics telehealth applications providing good to fair scientific evidence are listed in Table 2.1, and the origins of studies are given in Table 2.2. Most (75%) of the studies were American.

Table 2. 1 Areas of study for Geriatrics telehealth applications

Area of study	RCTs	Non-RCTs
Chronic heart failure / cardiac	3	
Hypertension	2	
Oncology		1
Mental health	1	1
Persons with disabilities		1
Home support, incl. Emergency response	3	1
Medications	2	
Information		1

Table 2.2 Origin of Geriatrics telehealth studies

Country	Number of studies
USA	12
UK	2
Canada	1
Spain	1

Geriatric Telehealth Applications and Social Determinants of Health

Table 2.3 lists the general areas of benefit of telehealth that are supported by Good to Fair scientific evidence.

Table 2.3 Areas of benefit from Geriatrics telehealth studies

Area	Number of studies*
Access	8
Cost / Cost-effectiveness / health system utilization	6
Education	3
Support	4
Acceptability / client satisfaction	6
Health outcomes	3
Quality of care	2

* Some studies considered more than one of these areas

Thirteen of the 16 studies involved telephone-based applications such as telephone support, reminders or assessment, or in the case of the emergency response system, use of telephone lines to transmit emergency signals. Two of the thirteen telephone-based projects also involved videoconference / videophone technology, but in these studies, the addition of the video component did not provide benefits over and above the benefits realized from the telephone component.

Cardiac:

There is good evidence that for elderly patients with chronic heart failure, telephonic case-management supplemented by decision support software can reduce hospitalization rates, increase patient satisfaction with care, and enhance cost-effectiveness (Riegel et al, 2002). There is good-fair evidence of compliance in telemonitoring for chronic heart failure patients (de Lusignan et al, 2000).

Anderson et al (1989) demonstrated that telephone monitoring is an effective method of supervising the care of patients with paroxysmal atrial fibrillation (the average age of patients in this study was 57, so results are not specific to Geriatrics).

Hypertension:

Friedman et al (1996) provide good evidence that weekly use of an interactive computer-based telecommunications system as a supplement to physician visits for hypertensive patients improved medication adherence and blood pressure control and was cost-effective, particularly for patients who were initially non-adherent in their medication use.

A UK randomized controlled trial attempted to manage the care of geriatric hypertensive patients utilizing a computer decision support system and cardiovascular risk chart; however, there was no evidence of benefit in terms of cardiovascular risk (Montgomery et al, 2000)

Oncology:

There is good-fair evidence that oncology patients can be cared for at home and avoid hospitalization if provided with 24-hour telephone support from a doctor and home visits by a specialized nurse team dispensing specific treatments (e.g., chemotherapy, parenteral feeding, intravenous therapy, blood transfusions, pain treatment and functional rehabilitation). This program has implications for costs and on independent living for patients.

Mental Health

A study by Hunkeler et al (2000), provided good evidence that nurse telehealth care resulted in reduced symptoms, improved functioning, and greater satisfaction with care for depression; however, the program did not improve medication adherence.

The Structured Telephone Interview for Dementia Assessment (STIDA) and its short form were shown to be efficacious tools for detecting dementia and may have utility for initiating early intervention for AD (Go et al, 1997).

Persons with disabilities

In a case-control study where an automated telephone monitoring system was used to assess changes in functional status in community-residing disabled elderly persons, it was found that the in-person method captured more information (Mahoney et al, 1999). However, the telephone system was proven to be reliable and may be useful as a means to target individuals for further professional assessment. The authors note the importance of identifying and responding to clients' perceived needs (i.e., listening for client-identified needs rather than relying solely on needs as indicated by the results of the assessment tool).

Home support

There is fair evidence from a cohort study evaluating the Lifeline Program, which uses telephone lines to provide emergency response for community-residing elderly people, shows that the technology can reduce inpatient utilization (Roush and Teasdale, 1997). The program did not have a statistically significant effect on Emergency Department visits. This intervention also has implications for enhanced feelings of security, self-efficacy and independent living.

In a randomized controlled trial in Quebec, Infante-Rivard et al (1988) did not find a significantly significant difference in ambulatory encounters in a home telephone support program.

Wasson et al (1992) demonstrated that a Veterans population experienced reduced inpatient and outpatient health system utilization and health reduced costs due to a physician telephone care program. The authors state that the program was particularly cost-effective for men who had reported fair or poor overall health at baseline. Welch et al (2000) tried to replicate the Wasson study in Veterans Clinics in Colorado and South Dakota, but their intervention did not show any effect on utilization or health status.

There was fair evidence from a qualitative study (Brennan et al, 1994; Galienne et al, 1993) that an electronic network proving information, peer communication, and access to a professional, to caregivers of persons with Alzheimer's Disease was successful in supporting the caregivers. This has implications for quality of care, independence and quality of life, as well as social support.

Medications

In a RCT in New York, Fulmer et al (1999) found that telephone and video-phone calls increased compliance with medication regimes. There was no added benefit of the video-phone over the telephone.

Neafsey et al (2000) used an interactive multimedia computer software program to test its effectiveness on adults' knowledge of potential interactions of prescription medications with over-the-counter drugs and alcohol, to increase self-efficacy (i.e., feelings of confidence regarding self-care) and avoidance of such interactions. The experimental group showed improvements in knowledge and self-efficacy.

Information

A computer-based medical decision-support system (MDSS) was not effective in assessing the accuracy of medication recording in the electronic medical records (Wagner and Hogan, 1996).

In a UK cluster randomized controlled trial (RCT), Montgomery et al (2000) were unable to show that hypertensive patients managed either by a computer decision support system and a cardiovascular risk chart

Demostrated benefits of telephone-based applications:

Many of the studies described above demonstrated benefit for telephone support and assessment. This evidence is summarized here:

- Decreased utilization of health services (Riegel et al, 2002; Subirana Serrate et al, 2001; Wasson et al, 1992; Roush & Teasdale, 1997)
- Decreased cost / cost-effectiveness (Riegel et al, 2002; Subirana Serrate et al, 2001, Friedman et al, 1996; Wasson et al, 1992; Roush & Teasdale, 1997)
- Improved clinical outcomes (Hunkeler et al, 2000; Friedman et al, 1996; Wasson et al, 1992)
- Equivalent or increased patient satisfaction with care (Riegel et al, 2002; Hunkeler et al, 2000; Wasson et al, 1992)
- Improved medication adherence (Fulmer et al, 1999; Friedman et al, 1996)
- Efficacy in screening / assessment (Mahoney et al, 1999; Go et al, 1997)
- Information transfer: patient to provider (de Lusignan et al, 2000)

Comment on Non-Comparative Studies

There were a number of descriptive studies that introduced innovative approaches in Geriatric telehealth, with socio-economic implications.

Other suggested benefits of telephone-based applications:

- Enhanced quality of care: increased frequency of clinician contact can lead to more timely, appropriate treatment (Subirana Serrate et al, 2001)
- Decreased waiting and travel time for patients (Wasson et al, 1992)
- Increased sense of security; increased ability for elderly people to live independently (Roush & Teasdale, 1997; Infante-Rivard et al, 1988)
- Enhanced social/emotional support (De Leo et al, 1995); coping skills (Strawn et al, 1998)
- Enhanced self-care / health promotion (Castro et al, 2001)
- Increased family cooperation and reduced level of stress experienced by relatives (Subirana Serrate et al, 2001)
- Improved client satisfaction, possible cost-effectiveness (i.e., telephone assessment; McGrew and Quinn, 1997)
- Reduced costs and hospitalization (Anonymous, 2001; in Disease Management Advisor)

Socio-economic indicators:

Life Stress:

- Two articles mentioned a reduction in life stress for patients. Markson et al (1992) for a computer check-up service; and Berkman et al (1999) for a telephone check-in service.
- Berkman et al (1999) discuss telephone support for elderly persons in Israel during a time of crisis: the Gulf War of 1991.

Quality of Care:

- Magnusson et al (1997) examined quality of care in terms of improving caregivers' ability to provide care for elderly persons.
- A fall prediction system in elderly peoples' homes may prevent falls (Cameron et al, 1997) or warn professionals regarding a change in patient behaviour while the patient is in the home (Chan et al, 1998). These initiatives indicate the potential of artificial intelligence to increase quality of care, and also relate to the socio-economic indicator, innovation.
- Tang et al (2000) suggested that continuity of care can be enhanced through video-consultation (i.e., coordination of physician activities)

Quality of Life:

- Magnusson et al (1997) suggest the possibility of the ACTION (assisting carers using telematics interventions to meet older person's needs) system to maintain or enhance the quality of life of older disabled persons and caregivers.

Social Isolation and Support, Independence and Self-care:

- Family caregivers of elderly persons can be provided with support through computer systems which allow for direct access to care information and practical advice. This service can improve caregivers' competence and ability to provide care and may alleviate problems associated with social isolation (Magnusson et al, 1997).
- A descriptive article by Markson et al (1992) reviewed a pilot project which suggested that using computers as clinician extenders made patients feel more secure or less worried about their illness, and made them feel like active participants in their own medical care. These factors could have a positive impact on elderly persons' independence.
- Castro et al (2001) examined a home-based exercise program supported by telephone counselling. This intervention relates to health promotion, and specifically, support for improved self-care practices.

Patient Satisfaction and Perception:

- A descriptive study by Macduff et al (2001) addressed issues of users' perceptions telehealth and patient satisfaction.
- Stiles et al's (1998) pilot study noted that both participants and consultants reported an overall positive experience with the use of a nutrition telemedicine consultation.
- Patients and families reported satisfaction with video consultation in a geriatric mental health program (Johnston & Jones, 2001).

Access:

- Tele-mental health can be used to deliver services to rural populations that may not otherwise receive services; and video consultation can facilitate emergency consultations (Tang et al, 2001).
- Macduff et al (2001) address the convenience to patients of using telemedicine.
- Scalvini et al (1999) examine the initiative of enhanced professional support to rural physicians. Improved access to speciality consultation relates to the socio-economic viability of rural communities, in terms of retaining skilled professionals.
- An interactive satellite teleconference enabled patient and provider access to tele-learning (Coogle et al, 1995).

Geriatric Mental health applications

Access to information

In the area of geriatric mental health, a number of initiatives have been described that relate to patient tele-assessment and increasing providers' access to information. This could impact on timeliness and quality of care.

- Elderly patients in the waiting rooms of two general practices in Brisbane, Australia, were provided with a computer-based screening instrument containing a questionnaire designed to diagnose depression (Hegarty et al, 1996).
- Telephone administration the SF-36 (Weinberger et al, 1994)
- Ames (1992) tested the 4-year predictive validity of a computerized diagnostic program to derive psychiatric diagnoses for elderly persons with depression.

Cost

- It has been suggested that video consultations in geriatric mental health can
    - decrease hospitalization rates (Lyketsos et al, 2001),
    - save travel time and cost for patients (Johnston & Jones, 2001),
    - save travel time and costs for care providers as compared with on-site visits, and be cost-effective in some settings (Tang et al, 2001).

- An important concern raised by Montani et al (1997), as well as Jones et al (2001), is that there can be limitations in video consultation programs due in part to technology. In the absence of federal regulations regarding video technology and clinical accuracy, professional organizations need to set clinical standards for telemedicine in special populations such as geriatric psychiatry (Jones et al, 2001).

Summary of Economic Studies

(For full details refer to Chapter 11: Economic Analysis.)

The geriatric studies employed mainly a health care perspective in the economic analysis. The quality of the few studies found in the field was weak to moderate. The results show that the telephone can be a cost saving method of providing medical advice to geriatric patients due to reduced use of hospital /nursing home services. In the long-term care setting the utilization of videoconferencing for chronic wound consultations was also seen as cost-saving since both the transportation of chronically sick geriatric patients and visiting of specialists at long-term facilities are relatively expensive alternatives to videoconferencing. Because the evidence is based on relatively few economic studies with low or moderate quality, these results can be considered to be tentative. There is a need for more studies to confirm these results, e.g., in Alberta.

Applicability to Alberta

A limited number of psychometric tests have been validated for use via telehealth (phone and videoconferencing). The short form of the STIDA is potentially useful tool for the provincial mental health help line, which is slated for integration with the Health Link service (Go et al, 1997).

Hunkeler et al (2000) present an augmentation to physician care for depression. The challenge is who would be responsible for delivery of the nurse telecare. Care of geriatric psychiatric patients in the community often falls to home care although other parties include mental health clinic staff, community geographic or outreach teams (e.g., Central Alberta Psychogeriatric Community Outreach Service). Divestiture of Alberta Mental Health Board (AMHB) clinics to the health authorities may help in coordinating opportunities for this kind of intervention.

Fulmer et al (1999) found that telephone and videophone both showed increased medications compliance regarding chronic heart failure and this speaks to the merit of Alberta telehealth business cases including consideration of the simplest/ most cost-effective technology. Some already are doing this. For example, the Capital Health Authority Telehealth Business Plan template includes analysis of alternate approaches.

In Alberta, tele-homecare has not yet been widely adopted. The study done by de Lusignan et al (2001) contributes to the evidence supporting telehomecare. Northwestern Health Services Region has recently purchased equipment for this purpose. There are presently outstanding questions with need for development of technical standards for this application.

Subirana Serrate et al (2001) discuss alternate care of oncology. The Mazankowski report encourages alternate models of care. It is interesting to note that one support to a service of this kind in Alberta could be the Link Service, which is rolling out provincially and is including new services/ innovations.

Friedman et al (1996) have an interesting approach in their article on automated telephone monitoring of hypertensive patients which could be compromised by existing Fee for Service Billing plan - probably most applicable to physicians compensated under alternate payment plans.

Chapter 3: First Nations Telehealth

Highlights

- Interactive computer programs are an effective means of providing education and assessing behavioural risk. It is important that information be delivered in a culturally sensitive context.

- A 3-year federal Health Transition Funds project, consisting of telehealth initiatives in five First Nations communities across Canada, delivered the following policy recommendations:
    - Increase connectivity to rural and remote communities, and especially Aboriginal communities;
    - Undertake new research further to implementation of successful telehealth initiatives in First Nations and Inuit communities, and regarding the impact of telehealth on costs, health services and human resources;
    - Promote equality of opportunity for telehealth across First Nations and Inuit communities;
    - Increase awareness and understanding of telehealth opportunities among First Nations and Inuit stakeholders;
    - Create linkages between telehealth and other initiatives of the Aboriginal Health Infostructure in order to leverage investments.

  (Health Canada, 2001)

- Telehealth can improve access to services for remote First Nations communities.

- The ability to access mental health services in the local community via telehealth may represent a significant quality of life benefit.

Statistics on the literature

The literature search identified 4 Randomized Controlled Trials (RCTs) and 39 non-RCTs related to First Nations. One of the RCTs and 7 of the non-RCTs were identified as pertaining to telehealth and having socio-economic implications. These eight sources are described here. Data from these sources were abstracted and can be found in Appendix G – Critique First Nations.

Location of Studies and Areas of Application

Only two comparative studies were found in the literature search: one RCT (Schinke et al, 1994) and one cohort study (Lapham et al, 1993). Both were US studies and both had patient education components. Six other non-comparative studies were included, as some of them contain valuable recommendations and/or insights regarding the benefit of telehealth for First Nations. Four of the six described Canadian projects; one was from the US and one from Australia.

First Nations Telehealth and Social Determinants of Health

Education

A study by Schinke et al (1994) involving 368 Native American youths, aged 10-14, in the South-eastern US, sought to test an effective way of reducing cancer risks and improving dietary choices. The study randomized participants into an intervention group where they completed an interactive computerized lesson using Native American legends to provide information about cancer reduction through diet and not smoking. Participants in the control arm did not receive the software intervention. Those in the intervention group increased their scores on 8 of 12 knowledge items. The importance of presenting material within a culturally-sensitive context was emphasized.

Computer assessment

In a study by Lapham et al (1993), Native American women receiving prenatal care at two clinics in New Mexico were contacted and, if eligible, were asked to complete the Pregnancy Information Program, an interactive computer program designed to assess behavioural risks and provide health education for pregnant women. A total of 265 women were enrolled over 13 months. More than 95% of participants who completed the computer interview rated it favourably and the majority of women reported learning new information through the program.

Drug use and physical abuse were reported significantly more often during the computer interview compared with the information obtained from the patients' medical records. The accuracy of self-reporting regarding recent drug use was validated in the results of urine drug screens.

The study findings cannot be generalized to all Native American women as the participants in the study were primarily urban. However, the authors conclude that computerized assessment is well-received by patients and yields valid information regarding risk factors for adverse pregnancy outcomes.

Comment on non-comparative sources

Although the following projects do not provide any scientific evidence of effectiveness of telehealth as compared to traditional health care delivery methods, they do suggest important socio-economic considerations, many of which are unique to Aboriginal populations, as well as policy recommendations.

Canadian projects

The federal Health Transition Funds project (1998-2001) consisted of telehealth initiatives in 5 First Nations communities across Canada (Health Canada, 2001). Evaluation outcomes of the projects included:

- Response to community health needs;
- Acceptability of telehealth by patients and families, and satisfaction with quality of care;
- Improved access to needed, quality care;
- Development of professional skills and competencies of local staff through telehealth training, improved access to outside expertise and associated increased confidence in care and skills;
- Indications of decreased efficiency (e.g., related to increased appointment length in telehealth consultations and no-shows);
- Increase in cost of care due to improved access to care, but cost savings associated with patient transfers avoided;
- High level of integration and sustainability evidenced in some applications (real-time technologies are advantaged over store-and-forward systems);
- Linkage with other provincial telehealth systems;
- Increased awareness and knowledge of local conditions/ resources among health service providers.

The report also provides specific outcomes for each of the five community projects.

Critical success factors are identified for telehealth implementation in First Nations and Inuit communities. These factors relate to community, funding, management, health care/educational practice, technology and policy.

Overall recommendations of the project include:

- Increase connectivity to rural and remote communities, and especially Aboriginal communities;
- Undertake new research further to implementation of successful telehealth initiatives in First Nations and Inuit communities, and regarding the impact of telehealth on costs, health services and human resources;
- Promote equality of opportunity for telehealth programs and research across First Nations and Inuit communities;
- Increase awareness and understanding of telehealth opportunities among First Nations and Inuit stakeholders;
- Create linkages between telehealth and other initiatives of the Aboriginal Health Infostructure in order to leverage investments.

(Health Canada, 2001)

O'Neill et al (2000) describe a telehealth demonstration project serving a geographically large, culturally diverse (45% Aboriginal population) and sparsely populated area of northern Alberta. The purpose of the project was to facilitate enhanced primary health services, and the telehealth system was used for meetings, educational sessions (staff in-services), clinical consultations, and tele-ultrasound. A total of 42 telehealth sessions were conducted in 17 months. Observations and recommendations emphasize the importance of:

- initial needs assessment regarding telehealth applications,
- organizational preparedness with respect to technology and human factors (i.e., stakeholder support and user buy-in),
- user training,
- improved telecommunications to northern and rural communities,

- giving consideration to option of leasing equipment.

The Baffin Island Telemedicine Project, which involves videoconferencing, digital imaging and medical diagnostic services to support remote community Health Centres, aims to improve the quality of health care as well as quality of life for patients in isolated communities (Otto, 1999).

Information systems (Canada)
To facilitate the evaluation of intervention programs, the Medical Services Branch of Health Canada is providing an epidemiological database to the 126 First Nations Communities in Ontario listing data on:

- antibiotic resistance;
- clients with recurrent diseases, incomplete TB treatment, with Mantoux tests >=10mm, with a previous history of TB, a follow-up schedule for STD's, with a consultant's review pending, client follow-up plan, schedule and encounter summary;
- disease incidence and prevalence;
- a suicide registry; and
- an immunization register.

(Johnson, 1998) This initiative has implications for health services planning and improved access to health services.

Teleradiology (US)
Beck et al (1996) indicate the following advantages of a teleradiology system established to support a regional hospital in Alaska:

- Clinicians from the regional hospital reported increased satisfaction with the improved level of support, particularly regarding emergency case management;
- Specialists reported satisfaction derived from increased confidence in accuracy of diagnosis;
- Economic: potential savings due to patient transfer costs avoided.

Tele-mental health (Australia)
Lessing and Blignault (2001) received information on 23 out of 36 Australian telemedicine mental health programs through a postal survey. The authors cite the potential for telehealth to reduce inequities in health services access for rural and other specified populations (e.g., Aboriginals). They also emphasize the value of tele-mental health programs for Aboriginals, as transfer from their community to a regional centre for services can cause mental distress and feelings of alienation.

Summary of Economic Analysis

(For full details refer to Chapter 11: Economic Analysis)

There are no economic studies of First Nations telehealth applications. Since many of these communities are rural and remote, the economic analysis in the Rural and Remote Telehealth chapter is most applicable to these patients. However, First Nations populations may have some specific socioeconomic, cultural and epidemiological characteristics that might also influence the economic analysis of telehealth in this patient population. More research in this area is urgently needed.

Chapter 4: Home Telehealth

Highlights

- Utility has been demonstrated for broad clinical uses in home telehealth (chronic heart failure, chronic obstructive pulmonary disease, oncology, diabetes, wound care, asthma, anxiety, and cardiac vascular accident)
- Other than cost and quality of life, extremely few socio-economic indicators have been addressed
- A policy void has been identified
- Nurses can typically make at least twice the number of home telehealth visits than traditional on-site visits (e.g., 15 versus 6)
- The number of traditional homecare visits that can be performed using home telehealth varies from 12 - 46%, and needs clarification in Canada.

The use of telehealth to facilitate healthcare in the home setting has been referred to in Canada as 'tele-homecare'. The American Telemedicine Association (ATA) has concluded this term might be misleading since telehealth in this setting encompasses more than simply providing traditional homecare in a new manner. For this reason the term 'home telehealth' was recently adopted by the ATA. This term includes use of e-health for all forms of residence, e.g. nursing homes, and not just those in their own home.

Home telehealth studies lack scientific evidence (e.g., non-RCTs), but the results of evaluations to date demonstrate that telehealth technology works for many clinical needs, typically has high levels of clinician and patient satisfaction, and in select settings provides savings without compromising quality. Caution is needed when considering cost; as noted elsewhere in this review valid economic analyses are sparse. Examination of the integration of home telehealth into the continuum of care has been overlooked.

Similar to other aspects of this review, no studies identified or defined specific socio-economic outcome indicators. Clinical outcomes were addressed, but very few studies examined the effectiveness of e-health in improving health status or the outcomes of health care. Video, web-based, and telephone modalities were all used successfully in various settings.

Statistics on the Literature

The literature search identified a total of 479 abstracts related to tele-homecare. From these, 127 articles were selected for further review. The final set of articles included for analysis in tele-homecare consisted of 11 randomized controlled trials (RCTs) and 52 non-randomized studies. Reasons that the remaining 64 articles were rejected were that 1) the articles did not pertain to telehealth or 2) the articles did not contain any good to fair evidence for telehealth nor any reference to socio-economic indicators.

Analysis of the selected RCTs and non-randomized studies is given in Appendix H: Critique Tele-homecare.

Areas of application

The general areas covered by the selected studies are shown in Table 4.1. Telehealth in the elderly or geriatric population was the most common topic.

Table 4.1 Areas examined for home telehealth applications

Area of study	RCTs	Non-RCTs
General homecare (chronic heart failure, chronic obstructive pulmonary disease, diabetes, anxiety, wound care)	2	2
Diabetes	4	
Cardiac disease	2	5
Hypertension	2	4
Neonates / infants / children	1	3
Elderly / geriatric		9
Other (oncology, triage, IV therapy, hospice care, spinal cord injury, asthma)		10
Policy related		18

Origin of studies

Countries in which the studies were carried out are shown in Table 4.2.

Table 4.2 Origin of home telehealth studies

Country	Number of studies
USA	33
UK	10
Australia	4
China	3
Italy	2
Canada	1
Belgium	1
France	1
Germany	1
Greece	1
Ireland	1
Israel	1
Italy	1
Japan	1
Norway	1
Spain	1

Home Telehealth Applications and Social Determinants of Health

Very few studies directly addressed any of the social determinants of health identified for this review and resulted in rejection of many studies when full papers were reviewed. Many studies were descriptive in nature and therefore were given a 'poor' evidence categorization. This, however belies the considerable weight provided by the many examples of home telehealth applications available in the literature. Lacking is consistent use of defined outcome indicators or evidence of impact on any social determinants of health. The most commonly addressed variable was cost for either the healthcare system or the patient, with many papers indicating the potential for significant cost savings for one or both. However, as described elsewhere in this report, the rigour of studies in regard to economic analysis is very poor raising concern and scepticism for such claims. The next most common socio-economic variable considered was quality of life.

Indications from the reviewed papers are as follows:

General tele-homecare

This included telehealth applications for two or more of chronic heart failure, chronic obstructive pulmonary disease, diabetes, anxiety, or wound care. Methodological limitations existed, but there seems good evidence (two RCTs, two non-RCTs) that telehealth interventions (video- or telephone-based) can improve quality of life in different populations, and reduce hospital days of care or clinic visits. Some studies showed notable cost savings for patients, homecare agencies, and the healthcare system, mainly through improvements in efficiencies (e.g. travel time redirected to patient care, permitting a two-fold or more increase in patient handling).

Diabetes

Good evidence (5 RCTs) exists for the use of telehealth to improve the quality of diabetes care, including improved self monitoring and self-care, and better physiological control. Modalities have included video- and telephone-based interventions. Benefits to patients include improved access to care and quality of care, and reduced costs. Telehealth can also reduce after-hour on-site visits by remote access to insulin infusion pumps. Potential future cost savings to the health care system and to the patient from avoided or delayed complications have not been estimated.

Cardiac disease

Good to fair evidence (2 RCTs; 5 non-RCTs) exists for use of telehealth as an acceptable and reliable tool to monitor chronic heart failure and pacemaker patients. Some studies show substantial reductions in hospital readmission, emergency department visits, and overall cost of care. Modalities included telephone-based as well as video-based interventions, with some question as to the additional benefit of video capability.

Hypertension

Good to fair evidence (2 RCTs; 4 non-RCTs) exists for use of telehealth as a tool that could significantly improve care and reduce blood pressure levels of patients with essential and pregnancy-induced hypertension. This has been achieved through monitoring of blood pressure and medication compliance, and provision of education. Modalities included telephone-based as well as video-based interventions.

Neonates / infants / children

Good to fair evidence (1 RCT; 3 non-RCTs) exists for the use of telehealth to support special needs or very young children.

Elderly / geriatric

Poor scientific evidence (no RCTs, 9 non-RCTs) show telehealth interventions (video or telephone based) can improve quality of life. In addition multi-sensor monitoring in 'smart' homes can improve quality of life in different populations, and reduce hospital days of care or clinic visits. Expanded services (e.g. teledermatology) can be provided to nursing home residents in a cost effective manner that improves quality of care.

Other

This category included applications in oncology, triage, IV therapy, hospice care, spinal cord injury, and asthma. Scientifically poor evidence (7 non-RCTs) supports the use of telehealth for each of these applications. The feasibility has been clearly shown for each.

Policy-related

Scientifically poor (non-RCT) but generically good information is available. The potential application and value of home telehealth seems clear, and includes application not just in the 'home' but wherever the 'place of residence' may be (e.g., nursing homes, 'smart' homes). Widespread implementation will require fundamental changes in the current healthcare systems. For home-based applications the actual proportion of traditional home visits that could be performed using home telehealth appears dependent on country and patient characteristics and requires clarification in Canada. As this proportion increases so to does the potential for cost savings. Integration of home telehealth into the continuum of care and within existing healthcare systems is required. The need for clear policy and policy support of home telehealth, and for consideration of safety and risk management issues, has been identified as lacking. Additional 'lessons learned' provide guidance for implementation of home telehealth.

Overall, there is evidence for improved access to health care, improved quality of care, reduced costs from many different types of home telehealth applications focused on various patient populations.

Applicability to Alberta

Video technology suggests significant potential for increased access and increased efficiency using telehealth. There are numerous areas where video technology has been used successfully, such as with diabetic patients (Dansky et al, 2001), patients with chronic heart failure (Demiris et al, 2001; de Lusignan et al, 2001; Johnston et al, 2001), and those with spinal cord injuries (Phillips et al, 2001). Contrary to popular thinking, there are indications that seniors do not generally have "technophobia" as is commonly believed. The benefits from these applications have included cost savings to the system, improved clinical outcomes, quality of care and quality of life.

There is a great deal of support for the application of telephone interventions (Artinian et al, 2001; Biermann et al, 2000; Jerant et al, 2001; Noel et al, 2000; Piette et al, 2001;

Subirana Serrate et al, 2001; Wasson et al, 1992). This support emphasises the need to not discount or discard use of simple strategies such as preventative telephone-based patient care.

A study by Subirana Serrate et al (2001) comparing "home hospitalization" (i.e., homecare with 24-hour telephone support by a physician, as well as hospital-like care delivered by specialized nursing team) to inpatient care for oncology patients may be of interest in the Alberta environment but the issues of cost-effectiveness and breadth of application require further investigation. It is important to identify those populations that could most benefit.

There have been many other examples of successful home telehealth interventions (Gray et al, 2000; Mease et al, 2000; Rogers et al, 2001; Tsang et al, 2001). In a study done on diabetes patients, an electronic diary was used to help manage patient care from home (Tsang et al, 2001). This demonstrates the value of a model that uses forthcoming wireless technology applications in a population that is at risk for increasing morbidity (note the current SLICK program in Alberta). Clinical outcomes are not the only benefit of using these types of home-based technologies. Additional benefits include quality of care, and satisfaction with care, education for patients and families, as well as emotional support for families.

There is a need to consider user readiness regarding telehealth applications (Hanson et al, 2000). This requires identification of those categories or groups of patients and caregivers that could most benefit, while at the same time not assuming value to all patients and all caregivers at all times. This is an essential consideration when implementing a broad-based program.

Summary of Economic Analysis

The studies in tele-homecare involved several different patient groups (e.g., diabetic patients, oncology patients). They all introduced a new telemedicine service to replace either patients' hospital visits or the homecare visits of health care staff. The economic analysis showed that telehealth applications are as costly or cheaper than conventional alternatives. Only one of the studies used the societal perspective in the analysis, which indicates that some analyses may be underestimating the real societal costs and savings of these alternatives. The economic quality score values of the studies were moderate or good.

Although there is evidence that tele-homecare services can be cost-saving, more studies in the field are needed to confirm these results in Canada and Alberta.

Chapter 5: Tele-Mental Health

Highlights

- Improved outcomes and implications for quality of care were found in telephone-based interventions for patients with depression. A telephone-based behaviour therapy program could be effective for persons in rural areas with agoraphobia.

- Cost savings to health services and/or patients through the use of videoconferencing were found in five studies of telepsychiatry. Implications for cost efficiency were also found when doing video interviews with clients for neurpsychological rehabilitation.

Statistics on the literature

From the search for randomized controlled trials (RCTs), 19 abstracts were identified that appeared to describe randomized studies related to tele-mental health and 10 were selected for further review. Of these, three were subsequently excluded (one a feasibility study and two not dealing with telehealth). One study, which was not an RCT, was included with the non-randomized studies.

A total of 199 abstracts related to non-randomized studies were identified of which 74 were identified for further review. Nine articles were selected for analysis. Two papers related to a qualitative study that applied to several areas of telemedicine and were not considered for this chapter. The remaining 61 papers were rejected for analysis.

Analysis of the 16 included studies can be found in Appendix I – Critique Mental Health

Areas of application

The general areas covered by the selected studies are shown in Table 5.1. Telepsychiatry, covering management of a range of mental health conditions, was the most common topic.

Table 5.1 Areas of study for tele-mental health applications

Area of study	RCTs	Non-RCTs
Depression, primary care	3	
Panic disorder, agoraphobia	1	
Neuro-psychological rehabilitation	1	
Dementia caregiver support	1	1
Telepsychiatry		6
Behavioural modification - obesity		1
On line forum [obesity/abuse/psychiatry/anxiety disorder]		1
Telephone support for family physicians		1

Origin of studies

Countries in which the studies were carried out are shown in Table 5.2.

Table 5.2: Origin of tele–mental health studies

	Number of studies
USA	8
Canada	4
Australia	1
China (Hong Kong)	1
Finland	1
Norway	1

Mental Health Applications and Social Determinants of Health

Indications from the reviewed papers are as follows:

Depression in primary health care

While there were some methodological limitations in the studies, there seems good evidence (Hunkeler et al, 2000; Lynch et al, 1997; Simon et al, 2000) that telephone–based interventions can improve symptoms of depression in different populations. This has implications for access to health care, quality and probably costs.

Panic disorder – agoraphobia

There is fair evidence from a small-sample RCT (Swinson et al, 1995) that a telephone-based behaviour therapy program can be effective for persons in rural areas who have this condition. This has implications for access and quality of care.

Neuropsychological rehabilitation

Schopp et al (2000) demonstrated that, in a small RCT in a US setting, video interviews with clients are accepted by clients and are cheaper than face-to-face interviews (either at a major centre or through outreach). This suggests implications for cost efficiency, avoidance of travel and access to services.

Dementia caregiver support

Mahoney et al (2001) does not provide convincing evidence that a telephone-based intervention was able to help family caregivers to persons with Alzheimer's Disease in a US setting. There is fair-poor evidence (Strawn et al, 1998) that a telephone based intervention (caring caller) was helpful in the short term to caregivers of persons with dementia.

Telepsychiatry

Five of the studies on telepsychiatry (Simpson et al, 2001; Mielonen et al, 2000; Trott & Blignault, 1998; Elford et al, 2001; Tang et al, 2001) showed cost savings to health services and/or patients through use of videoconferencing. There were no other comparative data in these studies, which also included details of satisfaction surveys. The remaining study (Rohland, 2001) gave poor evidence of the influence of videoconferencing on Global Assessment Function scores in a rural population.

Behavioural modification

A small cohort study (James et al, 2001) gave fair-poor evidence that a weight loss intervention delivered through telemedicine was as effective as an in-person program, in a US military setting.

On-line forum (various disorders)

There is poor evidence from a survey approach (Kummervold, 2001) that use of an Internet-based forum influenced use and perceptions of mental health services.

Telephone support for family physicians

Fair-poor evidence from a survey-based approach (Kates et al, 1997) suggested that providing telephone back-up by psychiatrists for family physicians is an effective support mechanism and reduces utilization of mental health services.

Summary of Economic Analysis

(For full details refer to Chapter 11: Economic Analysis.)

In most cases, there were cost savings associated with the tele-mental health applications. In instances where the patients (and their caregivers) or health care professionals have to travel long distances for services, the break-even point where the telehealth alternative becomes cost-saving can be relatively low. In some cases telepsychiatry is the only feasible/economical way of delivering mental health services to rural and remote places. The inclusion of patients' and caregivers' travel costs is important in decision-making, since specialized psychiatric services (e.g., in Paediatrics) are generally only available in big cities.

The quality of the economic studies ranged between 2 and 7 on the Drummond scale; however, in general, the economic quality of the studies in tele-mental health was among the highest of all the subject areas in this review. Many of the study results are applicable to the Alberta health care environment.

Chapter 6: Teleradiology

Highlights

- Avoidance of patient transfer and evidence of cost savings were the most common areas of benefit in teleradiology. Cost-effectiveness can depend on economies of scale in terms of workload and distance.
- Potential quality of care enhancements include the elimination of some procedures and shorter time for patients to be informed of exam results.
- Telehealth can enhance educational opportunities for health care providers.
- Benefits to patients and their families such as improved access to health services, avoidance of travel and more rapid provision of care seem important factors associated with successful teleradiology services.

Statistics on the literature

From the literature search, 11 abstracts were identified that appeared to describe randomized studies related to radiology, 7 of which were selected for further review. Of these, three were subsequently excluded (all were concerned with assessing accuracy/feasibility of telemedicine links). Three randomized controlled trials (RCTs) were included for analysis in this chapter. A fourth study, which was not an RCT, was also included with the non-randomized studies.

A total of 589 abstracts related to non-randomized studies were identified of which 87 that potentially dealt with primary studies were selected for further review. A further 5 abstracts were referred for consideration after being located in searches for other parts of the project. Twenty-four papers were included for analysis in this chapter. Three papers were considered as part of the chapter on Paediatrics. Sixty-five papers were excluded from analysis, five of which duplicated findings reported previously. Of the excluded papers, 13 were identified as including potentially useful material related to socio-economic impacts of teleradiology.

Analysis of all 28 included teleradiology studies can be found in Appendix J – Critique Teleradiology.

Location of studies and Applicability to Alberta

The countries of origin of the studies and the settings for teleradiology are shown in Tables 6.1 and 6.2. The two studies from Hong Kong related to the same program. The Canadian study was from Alberta.

The most common form of teleradiology link covered by the studies involved communication between a major hospital and small hospital(s). These included six studies that considered management of neurosurgical cases, an area of success for teleradiology that has been noted in earlier reviews.

One of the studies was undertaken in Alberta and another nine gave results that seem generally applicable to the province. (See Appendix J – Critique Teleradiology.) A further 17 studies had some aspects that were applicable, often principles of operation or evaluation, while actual values obtained and health care settings used did not correspond so closely to the situation in the province. Results of two studies did not seem to be applicable to Alberta.

Table 6.1 Countries in which selected teleradiology studies were conducted

Country	Number of studies
USA	9
UK	4
Australia	2
China (Hong Kong)	2
France	2
Germany	2
Norway	2
Austria	1
Canada	1
Finland	1
Italy	1
South Africa	1

Table 6.2 Teleradiology links in selected studies

Type of teleradiology link	Number of studies
Small hospital – large hospital	17
Clinic or practice - hospital	4
Clinic and practices or small hospitals	1
Home care, follow up – hospital	3
Within hospital	1

Areas of benefit

Areas of benefit from teleradiology found in the studies are shown in Table 6.3. Avoidance of patient transfer and evidence of cost savings were the most common categories. Three studies used breakeven analysis approaches to indicate conditions for achieving savings in various settings. A positive influence on quality of care was another important theme. There was also some reference, usually anecdotal, to education of health care providers.

Table 6.3 Areas of benefits from teleradiology studies

Area	Number of studies*
Indications of cost savings	15**
Approaches to calculation of savings	3
Reduction in transfer of patients	10
Improved quality of care	3
Influence on treatment planning	2
Reduction in adverse effects	1
Reduced travel distance for patients	1

* Some studies considered more than one of these areas
** One study found that teleradiology was not cost-saving

Teleradiology applications and Social Determinants of Health

The results reported from the comparative studies on teleradiology are mostly directed towards issues of efficiency, with emphasis on cost savings and avoidance of patient transfer. There is also some evidence of impact on quality of care.

Influence of teleradiology on other social determinants of health is likely but less well established by available studies. Benefits to patients and their families from aspects such as improved access to health services, avoidance of travel and more rapid provision of care seem important factors associated with successful teleradiology services. However, in the studies reviewed such aspects were, for the most part, covered only by anecdotal accounts and to some extent by the results of satisfaction surveys. Benefits to remote health care providers through education was seen as another area of benefit, though not supported by comparative data.

Quality of evidence

The quality of available evidence of benefit from teleradiology is somewhat limited. Only three RCTs were located, one of poor quality. In another of the RCTs, the demonstrated benefits to health services were only in part attributable to telemedicine – which was one component of a broader intervention. Many of the non-randomized comparative studies provide limited detail and must be considered as giving weak evidence.

Comment on selected non-comparative studies

While the strength of evidence is lower than that in the comparative studies referred to previously, several non-comparative studies on teleradiology provide useful additional information.

Six studies gave general descriptions of the establishment and operation of teleradiology services, with indications of benefit through avoidance of patient transfer to major centres. These accounts tend to complement the material discussed previously. Six other studies give indications of improvements to the quality of care through use of teleradiology and one refers to benefits through reduction in travel time for physicians.

There was one qualitative study on teleradiology done by Franken et al (1996) which provided evidence of good quality. It examined perceived quality of teleradiology services by rural and central (urban) radiologists, technicians, and administrative personnel. The study employed both quantitative and qualitative methodologies. One positive perception was that teleradiology reports were as accurate as those from on-site radiologists. Negative perceptions included problems with oral and written communications. It is apparent in this study that on-site (i.e., central site) and rural radiologists, and technicians, differ in their demands and expectations regarding teleradiology. This study indicates the importance of understanding the human dimensions associated with telemedicine.

Summary of Economic Analysis

(For full details refer to Chapter 11: Economic Analysis.)

The studies in teleradiology show that cost savings do occur in several different areas of application. The most convincing evidence is found in teleneurology / teleneurosurgery, involving the transmission of CT and MR images. In some settings, cost savings do occur when transmitting x-ray images, if workload and distances are great enough. The studies show cost savings both in the consultations between primary and secondary care and between specialty consultations. The cost analysis was primarily from the perspective of the health care sector. The economic quality of the studies ranged from 1 to 8. It is likely that there are some teleradiology applications that are economically feasible in Alberta.

Only one economic study from ultrasound was found in the search. The transmission of ultrasound images utilizes videoconferencing technology. This means that the incremental cost of sending ultrasound images is not high, especially if one or both sites already have videoconferencing equipment. The study by Malone et al (1998) included a telemedicine network of obstetric services with a relatively high frequency of examinations per month (200 per site). With a lower patient volume the pay-back time of the investment would be longer. If conventional services are provided by visiting a specialist, the high travelling costs may make the telemedicine alternative cost-saving given a relatively low number of examinations per year; however, there was no cost calculation of this alternative.

Chapter 7: Renal Dialysis Telehealth

Highlights

- There have been few studies in this area of telehealth.
- Utility has been demonstrated for both haemodialysis and peritoneal dialysis.
- Primary benefits include convenience, cost, and travel savings for patients.

Statistics on the Literature

From the search for randomized controlled trials (RCTs), 3 abstracts were identified that appeared to describe RCTs related to dialysis and all were selected for further review. All were subsequently excluded since they did not represent RCTs, each describing a non-randomized study, and were then considered with the other non-randomized studies.

A total of 77 abstracts related to non-randomized studies were identified, of which 15 were identified for further review. One paper was in Italian and was excluded, and two other papers that represented repetitions of material covered in other reports were also excluded. Due to the small number of remaining reports (12), all were included for review.

Analysis of the reports is given in Appendix K: Critique Renal.

Areas of application

Telehealth has been used in the two primary clinical applications of dialysis: haemodialysis and peritoneal dialysis, as shown in Table 7.1.

Table 7.1 Areas examined for dialysis applications

Area of study	RCTs	Non-RCTs
Haemodialysis		7
Peritoneal dialysis		4

Origins of studies

Countries in which the studies were carried out are shown in Table 7.2. Two of the reports from the US discuss the same program, whereas those from Canada describe distinct programs.

Table 7.2 Origin of tele-dialysis studies

Country	Number of studies
Canada	3
USA	3
Australia	1
Germany	1
Greece	1
Italy	1
Japan	1

Dialysis applications and Social Determinants of Health

There is a surprising dearth of studies for the application of telehealth to dialysis. Given the continuing rise in the number of patients receiving costly dialysis treatment, that end stage renal disease represents a major morbidity for common diseases (e.g. uncontrolled diabetes), that treatment often means the need to travel to central locations for treatment, and that integration of monitoring technology with dialysis machines is relatively simple, the lack of telehealth application in this area was unexpected. Also unexpected was that the highest number of distinct studies had taken place in Canada (British Columbia, New Brunswick, and Ontario). As might be expected, very few of the studies directly addressed any of the social determinants of health identified for this review. Most reports were descriptive in nature, explaining the technology, telehealth, and dialysis process. Several were 'old' reports by telehealth standards, extending back to applications performed in the early 1990's. Studies extended from simple remote clinical monitoring of the dialysis process, through video consults and interaction with clinicians and patients, to remote adjustment of parameters during dialysis.

Indications from the reviewed papers are as follows:

Haemo- and Peritoneal Dialysis

The lack of RCTs represents a concern, and highlights the methodological limitations of the available studies. At best, current evidence could only be described as poor to fair. However, the apparent sustained nature of some of the dialysis programs would indicate that clinical and economic value exists. Certainly each study identified better access, equivalent or better quality of care, and reduced travel for patients as major benefits.

Summary of Economic Analysis

The review did not find any good economic studies related to renal dialysis. Telehealth applications in renal dialysis are mostly videoconferencing connections between satellite clinics and university clinics. The connections are used to supervise and monitor the care given in the satellite clinics, and to give specialized care consultations to satellite care patients in specific renal dialysis related conditions. There are also telehealth applications in home dialysis care, although they do not include proper economic analysis. The economic issues around renal dialysis cooperation via telehealth are significant, since patients require treatment several times per week. Problems in care may lead to substantial additional costs in ambulatory care with ambulance transportations and hospitalizations. More analysis is needed in the area to demonstrate cost-effective methods of maintaining high quality renal dialysis care in remote and rural satellite units and home dialysis.

Chapter 8: Rural & Remote Telehealth

Highlights

- Utility has been demonstrated for broad clinical uses.
- Other than cost, few socio-economic indicators have been addressed.
- A need exists for policy development.
- Policy leadership will greatly facilitate use of telehealth.
- As telehealth use increases the per-contact episode cost is likely to decline.
- Human factors such as 'rural ownership' of telehealth solutions must be addressed.

Although often inadequate from a scientific viewpoint, the results of telehealth evaluations to date have been consistent in showing that telehealth technology works for many clinical needs, and that patients are happy with it. However, examination of the social, organizational, and policy aspects have been largely overlooked.

No studies identified or defined specific socio-economic outcome indicators. Clinical outcomes were addressed, but very few studies examined the effectiveness of e-health in improving health status or the outcomes of health care.

Statistics on the Literature

The literature search identified a total of 1051 abstracts related to rural and remote telehealth. From these, 155 articles were selected for further review. The final set of articles which were included for analysis in rural and remote telehealth consisted of five randomized controlled trials (RCTs) and 30 non-randomized studies. Reasons that the remaining 120 articles were rejected were that 1) the articles did not pertain to telehealth or 2) the articles did not contain any good to fair evidence for telehealth nor any reference to socio-economic indicators.

Analysis of the selected studies is given in Appendix L: Critique Rural Remote.

Areas of Application

Telehealth has been examined in a broad spectrum of applications in rural and remote communities. The general areas covered by the selected studies are shown in Table 8.1. Teleconsultation, which covered administrative and educational activities in addition to the clinical applications noted, was the most common application of telehealth.

Table 8.1. Areas examined for rural and remote applications

Area of study	RCTs	Non-RCTs
Teleconsultation (radiology, cardiology, colposcopy, psychiatry, emergentology, dermatology, neurology, other)	2	9
Outpatient follow-up		1
Internet-based consultation	1	1
High-risk / rare disease patients (antenatal care, paediatric cardiology, sickle cell)		3
Telephone support (telecare / teletriage)	2	2
Nutrition		2
Policy related		12

Origin of Studies

Countries in which the studies were carried out are shown in Table 8.2.

Table 8.2. Origin of rural/remote telehealth studies

Country	Number of studies
USA	13
Canada	8
Australia	5
UK	4
Germany	1
Greece	1
Italy	1
New Zealand	1
Norway	1

Rural & Remote applications and Social Determinants of Health

Very few studies directly addressed any of the social determinants of health identified for this review. This was the sole reason for rejection of most studies when full papers were reviewed. Most studies were descriptive in nature, often recounting the technology and telehealth process, but not identifying suitable outcome indicators or providing evidence of an impact on any identified socio-economic determinant of health. The most commonly addressed variable was cost for either the healthcare system or the patient, with many papers indicating the potential for significant cost savings for one or both. However, as described elsewhere in this report, the rigour of studies in regard to economic analysis is very poor, raising scepticism for such claims. When considering investment in rural and remote telehealth solutions, a major policy consideration is that return on investment differs according to perspective (i.e., the patient, versus provider, versus system) and includes issues such as increased access.

Indications from the reviewed papers are as follows:

Teleconsultation:
Some methodological limitations existed in the studies, but good evidence (two RCTs, nine non-RCTs) showed interactive-video consultation is effective and efficient, and increases access to health care. The broad applicability of this modality was clear (radiology, cardiology, colposcopy, psychiatry, emergentology, dermatology, neurology, other). There are implications for avoidance of travel (patient and provider), quality, and possibly cost.

Outpatient follow-up:
Poor evidence (one non-RCT) demonstrated the utility of telehealth for outpatient follow-up.

Internet-based consultation:
Good evidence (one RCT) showed that low-technology approaches such as Internet-based exchange of images and consult requests can be effective. This study was specifically related to developing countries, but may have broader application. Implications again exist for access, avoidance of travel, quality of care, and cost.

High-risk / rare disease patients:
Telehealth increases access for rural or remote patients with rare diseases or special needs (i.e., antenatal care, paediatric cardiology, sickle cell), without an increase in the number of specialists. Access to specialty care increased. There are implications for avoidance of travel, quality of care, and cost.

Telephone support (telecare / teletriage):
There is good to fair evidence (two RCTs, two non-RCTs) of the utility and potential value of use of the simple telephone for either teletriage/telecare or patient monitoring. All studies lacked evidence of long-term impact. The avoidance of literacy problems when using the telephone was noted. There are implications for access, avoidance of travel, quality of care, and cost.

Nutrition:
Poor evidence (two non-RCTs) demonstrated the ability to provide nutrition counselling remotely and effectively. Reduced travel was the primary benefit, although there are also implications for access and quality of care.

Policy related:
Scientifically poor (non-RCT) but generically good evidence indicates a need for development of clear telehealth-related policy. Five of the twelve policy-related studies specifically identified the inter-jurisdictional or general telehealth policy void as an issue of immediate concern. Additional 'lessons learned' provided generic guidance for implementation of telehealth. Implications for integration of telehealth into mainstream healthcare.

Applicability to Alberta

Videoconferencing is a technology that has applicability in Alberta. It has been applied to teledermatology and neuropsychological assessments, and in both areas has shown quality of care and cost benefits to patients, as well as educational benefits to physicians (Oakely et al, 2000; Schopp et al, 2000).

There have also been evaluations of videoconferencing technologies that have led to important questions of readiness. In a study done by Campbell et al (2001), the classification scheme and associated strategies for implementing new technologies in each category could assist in current and future programs.

Teleradiology is another area that has applicability to Alberta (Tually et al, 1999; Tually et al, 2001). In nuclear medicine, oncology, musculoskeletal injury and cardiovascular disease, there appears to be cost benefits to patients, quality of care in terms of referral patterns leading to early diagnosis, and education for primary care physicians.

Telephone interventions, used in their various forms for diabetic and blood pressure interventions, can be considered applicable to Alberta (Hunkeler et al, 2000; Liesenfeld et al, 2000; Piette et al, 2000). There is potential for improved clinical outcomes, as well as enhanced quality of care.

The question of diagnostic accuracy regarding telehealth is pertinent. In a study estimating the efficacy of telemedicine colposcopy for women, the diagnostic accuracy of distant experts was similar to that of on-site experts (Ferris et al, 2002). This evidence should be considered with respect to Alberta's cancer programs.

There is a need to examine the impact of telehealth and remote consultations in the job situation, as well as considering how the working environment could be improved for those involved in telehealth (Monrad Aas, 2002). There are many positive aspects of telehealth, such as benefits related to travelling (less travelling to see patients and less need to travel in bad weather) and an increased sense of professional communication and security.

Summary of Economic Analysis

Rural and remote telehealth applications involve several different specialty areas that utilize different technologies, hence they are difficult to compare and summarize. Generally, the studies showed that it is economically feasible and in most cases cost effective to use telehealth in rural/remote consultations. However, that conclusion cannot be applied to all rural sites and to all specialties in Alberta and northern territories, since some of the studies involved considerably greater volumes of patients than are present in parts of rural or northern Alberta. If health care provider costs only are included, the telehealth alternative is not always cost-saving. However, if patients' travel and lost working time are included, many of the telehealth alternatives become cost-saving from a societal perspective. In addition, it is very difficult to measure the value of increased access to care, equity in health, and the value of health care staff education during consultations to remote and rural areas.

The quality of economic studies in the field varied greatly (between 1 and 8). More economic studies are needed that are specially connected to the rural/remote environment in Canada and Alberta since there may be some variation as compared with the US or UK environments.

Chapter 9: Telerehabilitation

Highlights

- Educational interventions delivered by telephone or video can improve clinical outcomes and reduce hospitalization rates.
- Home-based transtelephonic exercise monitoring for cardiac rehabilitation patients is an effective alternative to a hospital-based program, and provides socio-economic benefits to patients (e.g. access, cost).
- Use of a computer program can help children with hearing impairments improve speech perception and speech production skills (Zwolan et al, 2000).
- Use of videoconferencing for patient assessment has evidenced acceptability in neuropsychological rehabilitation and was shown to be effective in spinal cord injury rehabilitation and to result in more patients returning to work. Telehealth has the potential to improve access to assistive technology assessment/intervention for disabled patients.
- It is suggested that telerehabilitation programs enhance patient involvement in care and patient independence.

Statistics on the literature

A total of 117 articles and other sources which appeared to be related to telerehabilitation were identified in the literature search. These consisted of 11 randomized controlled trials (RCTs) and 106 non-RCTs. Upon review of abstracts, 39 were selected for further review, four of which were RCTs. One RCT pertained to Paediatric teleradiology and is included in the teleradiology chapter. Evidence from the remaining three RCTs was rated as good and good-fair, and the results are reported in this chapter.

Of the 35 non-RCTs, three provided good-fair evidence of the effectiveness of telehealth in certain applications. Thus there were a total of six RCTs and non-RCTs providing Good to Fair evidence in accordance with the 1995 Jovell/Navarro-Rubio scale (Hailey et al, 2002). Fifteen other studies were included for comment as they presented insights or policy implications in telerehabilitation related to social determinants of health. These studies were descriptive (non- experimental) or were non-randomized controlled trials, non-controlled clinical series, or case reports where the strength of evidence was poor.

Analysis of the 21 included studies can be found in Appendix M – Critique Telerehabilitation.

Location of studies and areas of application

Tables 9.1 and 9.2 indicate the areas of study and the country of origin, respectively, of the telerehabilitation studies.

The spinal cord injury (SCI) and wound assessment studies were conducted at the Shepherd Centre in Atlanta, US. The Shepherd centre is a rehabilitation hospital serving people with disabilities following catastrophic injury or illness affecting the central nervous system. Three other descriptive studies pertaining to wound care at the Shepherd Centre were identified; these are included for comment in the section on non-comparative studies.

Table 9. 1 Areas of study for telerehabilitation applications

Area of study	RCTs	Non-RCTs
Spinal cord injury	1	
Wound assessment		1
Cardiology	2	
Paediatrics		1
Acquired brain injury		1

Table 9.2 Origin of telerehabilitation studies

Country	Number of studies
USA	5
Canada	1

Telerehabilitation applications and Social Determinants of Health

Table 9.3 lists the general areas of benefit in telerehabilitation.

Table 9.3 Areas of benefit from telerehabilitation studies

Area	Number of studies*
Cost / CE / health system utilization	2
Education	1
Acceptability / client satisfaction	2
Quality of care	1
Quality of life	3

* Some studies considered more than one of these areas

Spinal cord injury (SCI)

There is good evidence in the preliminary results of the Phillips et al (2001) study that SCI patients who receive structured education sessions via telephone or videoconference have higher quality of life scores than controls. In addition, annualized hospitalization rates were 3 days for the video, 5 days for the telephone and 8 days for the standard care group.

Wound Care

Phillips et al (1999) found that weekly video and telephone counselling sessions for SCI patients were feasible for assessing pressure ulcers. There were more pressure ulcers identified in the video group. The authors suggest that assessment and identification of ulcers was facilitated by videoconferencing.

Telehealth was not economical from a health system point of view as annualized Emergency Department visits, hospitalizations and health care provider visits were lower or the same in the standard care group. However, substantially more people in video intervention group returned to work. This is an important social indicator. The authors suggest that telehealth may promote self-efficacy among SCI patients, thereby leading to better community reintegration and adjustment.

Cardiac telerehabilitation

In a randomized controlled trial of provision of web-based education and support for cardiac rehabilitation patients, the treatment group rated resources as useful in providing information, enhancing quality of life, coping with their disease and reducing social isolation (Bates et al, 2001 - 2 articles submitted for publication). At seven months post-intervention, there were no differences in cardiac risk factors, but the treatment group scored significantly lower on the quality of life scale and higher on the depression scale. The authors discuss possible reasons for this unexpected result and suggest that use of telehealth for secondary prevention requires further study.

Sparks et al (1993) conducted a small-sample RCT to evaluate home-based transtelephonic exercise monitoring program versus a hospital-based program. The two groups had statistically equivalent improvements in functional capacity and exercise compliance. The authors conclude that at-home exercise is an effective alternative to a hospital-based program.

The advantages of home-based for cardiac rehabilitation patients may include flexibility of timing/scheduling, reduced travel and increased family support. This telehealth application may be a strategy to increase patient compliance in rehabilitation programs and thus enhance health outcomes.

Telerehabilitation for children with hearing impairment

Zwolan et al (2000) studied speech perception in children with severe sensorineural hearing loss which had occurred prior to age 15 months and who had cochlear implants. The intervention group patients used the Foundations in Speech Perception (FSP) software program on a daily basis in their homes for a period of six months. Improvements in the intervention group were significantly greater than controls on two speech recognition tests. Those who used the software more frequently experienced greater improvement. A questionnaire provided to parents indicated a high level of satisfaction with FSP software.

Acquired brain injury

Schopp et al (2000) evaluated the acceptability of videoconferencing for neuropsychological assessment. Fifty-two patients with cognitive dysfunction were interviewed via videoconference and 52 age- and diagnosis-matched controls were interviewed in person. Those assessed by videoconference were more likely to want to repeat their experience. Both groups reported equally feeling relaxed and feeling that the neuropsychologist showed caring. On the other hand, the neuropsychologists were less satisfied with the videoconference system.

Non-comparative studies

The following potential socio-economic benefits were identified in the descriptive literature in telerehabilitation:

Access

- Telerehabilitation has great promise for expanding availability, accessibility, affordability of services for persons with disabilities, e.g., assistive technology specialty services (Malagodi & Smith, 1999; Burns et al, 1998)

Cost

- Telerehabilitation can save patients' travel time and costs (Vesmarovich et al, 1999).

Quality of care:

- Diagnosing skin conditions through verbal description alone is not reliable, thus video-based interventions can be an effective way to assist patients and provide them with education (Phillips et al, 1998).
- Telemedicine can facilitate assessment of certain problems that occur a specific situations (e.g., infant feeding problem)
- A video link to the patient's home can give the provider more insight into problems related to the family or the home itself
- Coordination of care: Telehealth makes it easier for others involved in a child's care to participate in their rehabilitation; i.e., therapists, social workers, case managers (Artunian, 1997)

Empowerment:

- A key advantage proposed by Hauber et al (1999) is that telerehabilitation empowers consumers to take an active role in their own therapy.

Independent living:

- Integrated home systems technology, as described by Cooper and Keating (1996), may help to support clients (especially disabled) to live independently

Quality of Life:

- Ades et al (2000) used the Health Status Questionnaire (HSQ) to measure quality of life in a study of home-based ECG and voice transtelephonic monitoring. The HSQ includes the following domains of patient health status: general health perception, physical function, role limitation - physical and emotional, social function, mental health, bodily pain and energy/fatigue.

Health outcomes

- Computers have an important role to play in the rehabilitation of people with neurological disabilities. Specifically designed applications can enhance communication skills, motor skills, cognitive functions, social skills, mood, vocational rehabilitation and recreation/leisure activities (Stern et al, 1999). The needs of the patients and the adaptability of the computer must be taken into account when selecting suitable programs (Larsson et al, 1995).

- New technologies in virtual rehabilitation (VR) for orthopaedic patients are under development (Popescu et al, 1999). VR routines can include physical therapy (improving the patient's motor skills through exercise of muscles and joints) and functional rehabilitation exercises (regaining lost skills related to daily living or job-related skills). Telerehabilitation systems that record data from patient exercises allow therapists to remotely monitor the patient's progress.

Provider education, training, support

- A group of 39 rural mental health clinicians improved on knowledge scores after one-on-one training via videoconference. Telemedicine training and ongoing support for rural clinicians enables them to provide day-to-day management and care for patients with conditions such as brain injury, reserving specialist consultation for emergencies or complex problems (Schopp et al, 2000).

- Telehealth may help to alleviate some of the factors that contribute to stress and burn-out include in rural/remote working environments – i.e.: isolation from colleagues, high level of responsibility, no relief, and specialists find themselves also working as generalists (Jin et al, 2000).

Transtelephonic electrocardiographic monitoring (TEM) is a common telerehabilitation initiative; however, strength of evidence in many studies is not high. Squires et al (1991) describe the following advantages of TEM:

Remote site TEM (i.e., satellite clinic connected to central monitoring site)

- Enhanced patient safety and confidence due to availability of medical personnel on-site
- The remote facility does not need to purchase ECG monitoring equipment for its cardiac rehabilitation program
- Potential for better use of staff time at both remote site and central monitoring site

Home TEM

- Enhanced patient safety due to real-time ECG monitoring and communication with trained staff
- Convenience

- Enhanced patient independence with respect to the exercise program

Summary of Economic Analysis

The review did not identify any economic studies related to rehabilitation. The volume of telehealth applications in rehabilitation is increasing in Canada and elsewhere, hence there is an urgent need for economic assessment in this field.

Chapter 10: Telehealth Reviews

Highlights

- Evidence of efficacy & efficiency for telehealth has been demonstrated most frequently in the following areas of application: teleradiology, ECG transmission, tele-mental health, teledermatology and tele-homecare
- Telephone follow-up and reminders have become a prominent strategy in telehealth and there is evidence of cost-effectiveness.
- Decisions to use telehealth should be based on evidence showing comparable patient outcomes in the hospital/office environment and improved outcomes in homecare.
- Tele-homecare may be an effective response to changes in delivery of acute care and to the increasing population of chronically ill patients.
- Telehealth can enhance continuity of care by improving access and supporting coordination of activities by clinicians.
- Wootton (2001) recommends that an international body or national telehealth society take an overall coordination role in telehealth research.
- A number of valuable suggestions regarding evaluation and research in telehealth are provided.

Statistics on the Literature

The literature search located 124 abstracts related to telehealth reviews and 41 of these were initially selected and retrieved. A total of 29 reviews were included for analysis: 17 systematic reviews and 12 other reviews (e.g., literature reviews). Twelve reviews were excluded because they did not relate to telehealth and/or consisted of earlier articles by the same author and on the same topic as ones written later.

Analysis of the 29 reviews can be found in Appendix N: Critique Systematic Reviews

Areas of Application

The areas of application of the reviews, and number of studies covered by the reviews (if reported) are shown in table 10.1.

Table 10.1 Areas of Application of Review Articles

Area of Application	Authors	Number of studies reviewed
Systematic Reviews		
General / all types of telehealth	Currell et al, 2002	7 RCTs
	Hersh et al, 2001	25
	Balas et al, 1997	80
	Whitten et al, 2002	24
	Hailey et al, 2002	66
	Roine et al, 2001	50
	Hakansson & Gavelin, 2000	246
	Mair et al, 2000	Not reported
	Grigsby et al, 1995	Not reported
Focus on patient satisfaction	Mair & Whitten, 2000	32 RCTs
	Williams et al, 2001	93
Focus on doctor-patient communication	Miller, 2001	38
Tele-oncology	Campbell et al, 1999	15
Paediatric, obstetric, home telehealth	Hersh et al, 2001	46
Telepsychiatry	Baer et al, 1997	21 studies over 40 years
Telepsychiatry	Ball & McLaren, 1997	15
Telehealth in developing countries	Wootton, 2001	55
Other Reviews (not Systematic Reviews)		
General / all types of telehealth	Taylor part 1 1998	33
	Taylor part 2 1998	Not reported
	Loane & Wootton, 2001	Not reported
General / economic impact	Hailey & Crowe, 2000	20
General / survey of costs	Lobley, 1997	Not reported
Telepsychiatry	Capner, 2000	Not reported
Training / education	Pullum et al, 1999	5 programs, MT, USA
Teleradiology	Boland, 1998	Not reported
Tele-homecare	Kinsella 1998	Not reported
Teledermatology	Eedy 2001	Not reported
Acute & emergency telehealth	Benger 1999	6
Disaster / military	Garshnek & Burkle, 1999	11

Social Determinants of Health and Socio-Economic Indicators

Currell et al (2002) reviewed seven randomized controlled trials of telemedicine as compared with face-to-face patient care. The authors found few significant differences in clinical outcomes between groups, but some evidence of higher levels of satisfaction, improved clinical processes (e.g., medication adherence) and/or outcomes in the telehealth intervention groups.

In a review of 25 studies of home-based or office/hospital-based telehealth, Hersh et al (2001) found that telehealth outcomes were comparable or better than face-to-face care. There were modest benefits related to telehealth for chronic disease management, AIDS and Alzheimer's patients, and good evidence for comparable care in the Emergency Department setting and benefit in surgical and NICU. It was recommended that decisions to use telehealth be based on evidence showing comparable patient outcomes in hospital/office environments and improved outcomes in homecare.

Balas et al (1997) note that telephone follow-up and reminders are two of the most prominent telehealth initiatives being trialled at present. Sixty-one of the 80 clinical trials included in the systematic review involved provider-initiated communication with patients, generally via telephone. Telehealth resulted in significantly improved outcomes in studies of preventive care, osteoarthritis, cardiac rehabilitation and diabetes. An important benefit of telehealth can be enhanced continuity of care through improved access and coordination of activities by clinicians – physicians and others.

Systematic reviews by Hailey et al (2002) and Roine et al (2001), involving 66 and 50 studies respectively, found the most evidence of efficacy and efficiency for telehealth in the following areas of application: teleradiology (i.e., CT transmission), tele-mental health, ECG transmission, teledermatology, tele-homecare and some medical consults.

In reviewing studies of Paediatric, Obstetric and home telehealth, Hersh et al (2001) found that videoconferencing, self-monitoring and store-and-forward technologies can improve access to care, quality of care, and/or clinical outcomes.

Taylor (1998) states that clear benefit has been demonstrated for:
- transmission of scans for intra-cranial injuries, and
- telephone monitoring devices to support chronic disease management.

Loane and Wootton (2001) indicate that savings associated with telehealth are greatest for patients, but that from a societal perspective, telehealth can be economically viable when distances are substantial.

Concerns have been raised regarding the economic impact of telehealth on the health system; i.e., that telehealth may shift rather than save costs (Hakansson and Gavelin, 2000), and that improved access to care via telehealth will increase costs (Lobley, 1997; Boland, 1998).

The Patient Perspective

Three systematic reviews focused on specific aspects of patient perspectives in telehealth. Mair and Whitten *(2000) focused on patient satisfaction with real-time video* consultation, concluding that teleconsultation is acceptable to patients in a variety of applications but that the effect of telehealth on communication processes and interpersonal relationships requires further study.

In a review of 93 studies involving mainly videoconferencing technology, Williams et al (2001) found that reported levels of satisfaction with telehealth are consistently higher than 80%. However, the majority of studies were descriptive, lacking a control group for comparison.

Miller (2001) researched the effect of telehealth on doctor-patient communication, and identified the following important factors:

Factors rated positively overall:

- general communicative efficacy
- patient/provider comfort
- patient/provider relations
- level of anxiety
- audio quality
- video quality

Factors rated negatively overall:

- non-verbal behaviour
- lack of touch

Oncology:

Campbell et al (1999) reviewed 15 studies in comparing tele-oncology to conventional methods of providing cancer treatment to rural and remote populations. They concluded that tele-oncology was cheaper than outreach clinics but at least double the cost of central clinics.

Mental Health:

In a review of 21 studies of telepsychiatry, Baer et al (1997) found that telepsychiatry is feasible and well accepted by patients and doctors but is rated inferior to face-to-face consults. There are methodological deficiencies in the studies reviewed (i.e., most uncontrolled), therefore the results may not be generalizable. Programs in Alberta have demonstrated utility in telepsychiatry.

Ball and McLaren (1997) suggest that telephone and video-based cognitive assessment has been shown to be feasible; however, few methodological details were provided.

Teleradiology:

Teleradiology and teleconsultation, using store & forward and videoconference technology, is becoming standard practice for assessment of minor injuries from remote clinics in UK (Benger, 1999).

Teledermatology:

With respect to teledermatology applications, Eedy (2001) suggests that store & forward technology has a cost-effectiveness advantage over videoconferencing. The accuracy of diagnosis in teledermatology appears to be good but not as good as in face-to-face consultations.

Training/education:
Telehealth can be used in the delivery of continuing education to rural and remote health care providers (Pullum, 1999).

Applicability to Alberta

Telephone follow-up and reminders have become a prominent strategy in telehealth and there is evidence of cost-effectiveness. Alberta should give due consideration to use of telephone applications in delivering distance clinical care.

Many reviews identify lack of reimbursement structures as an impediment to the advancement of beneficial telehealth initiatives. This issue has been partially addressed in Alberta but needs to be more fully resolved.

Tele-homecare is regarded as the next major step for telehealth. With the advent of SuperNet (broadband network) and the long distances that home care providers need to travel in rural communities, tele-homecare offers potential in Alberta

Benefits that could be derived from a more comprehensive introduction of telehealth in the Emergency Department environment should be considered for Alberta. This can support providers and staffing levels at remote locations. Appropriate equipment including teleradiography systems would be required.

Telehealth Evaluation / Research

Several authors state that further research is required and provide the following direction:

- Advocate use of randomized controlled trials
- As telehealth moves in to long-term use, the effects on health status, costs and organization as well as ethical, social issues, and possible risks need to be considered (Hailey et al, 2002). In evaluating tele-homecare programs, researchers should consider clinical and other relevant outcomes other than "avoided hospitalizations" (Kinsella, 1998).
- The effects of telehealth on costs, access, practice patterns, and patient management require further study (Grigsby et al, 1995)
- Approaches for economic analysis need to include sustainability of the service; decisions on equipment and telecommunications; effect on the overall use of health program resources and measurement of outcomes (Hailey et al, 2002).
- Whitten et al (2002) suggest specific types of research design to best meet specific questions; for example, analysis of opportunity costs to show value of health resources in terms of best alternative use for such resources.
- Baer (1997) suggests a 3x3 matrix to evaluate telehealth: cost, quality and accessibility assessed from the client, provider and societal perspectives. Hakansson

and Gavelin (2000) also note the importance of distinguishing cost-effectiveness from the perspectives of different stakeholders.

- Mair et al (2000) cite ten recommendations to assist researchers improve methodology of future research on cost-effectiveness.
- Lobley (1997) cites 19 questions that need to be answered in conducting a cost analysis.
- Wooton (2001) suggests having an international body or national telehealth society take an overall coordination role in running trials, performing evaluations & disseminating results.

Chapter 11: Economic Analysis

The rating of economic studies can be found in Appendix O: Economic Analysis. Articles are rated on a scale of 1 to 10 based on the Drummond et al (1997) criteria:

1. Was a well-defined question posed in answerable form?
2. Was a comprehensive description of the competing alternatives given?
3. Was the effectiveness of the programs or services established?
4. Were all the important and relevant costs and consequences for each of the alternatives identified?
5. Were costs and consequences measured accurately in appropriate physical units?
6. Were costs and consequences valued credibly?
7. Were costs and consequences adjusted for different timing?
8. Was an incremental analysis of the costs and consequences of the alternatives performed?
9. Was allowance made for uncertainty in the estimates of costs and consequences?
10. Did the presentation and discussion of the study results include all issues of concern to users?

Following is a summary of the economic analysis by subject area.

Paediatrics

Dick et al, 1999. In this study a videoconferencing link was established between Thunder Bay and the Hospital for Sick Children in Toronto. A total of 140 Paediatric patients participated. Families were satisfied with the specialist services and they estimated that they saved on average $1,318 in travel and associated costs through teleconsultation. Though the study demonstrates significant cost saving for families of Paediatric patients, the other health care related costs were not estimated.
Economic analysis quality score: 0

Finley et al, 1997. In this study, Paediatric echocardiography (ECG) images were sent by video transmission from regional hospitals to a tertiary hospital in Halifax. The costs of the telemedicine system and avoided transportation costs were estimated (from a health care perspective). The cost of telemedicine system was C$90,000 and the transportation costs avoided from 31 patients were C$100,000-118,000. Service was comparable to a conventional one and can save money.
Economic analysis quality score: 3

Mulholland et al, 1999. The authors applied normal low-cost videoconferencing equipment for the transmission of ECGs from local hospitals to a regional hospital Paediatric cardiology unit. The study includes a very limited cost estimation of the savings to the system. They found that the teleconsultation system avoided 47 ambulance transportations to the regional hospital, resulting in US$22,560 cost savings to the hospital, while the cost of the system was about US$10,400.
Economic analysis quality score: 0

Rendina et al, 1998, 1998 and 2001. The three studies by Rendina and his coauthors indicate that neonatal telecardiology from regional hospitals to an academic hospital can

be cost-effective. After modeling the neonatal data from several regional hospitals, they found that telecardiology was associated with a 58% reduction in transfers to academic centre, associated with a reduction of US$150,000 in patient transfer costs. These three studies calculate on a very general level the health care costs averted via neonatal telecardiology. The generalizability of the economic analysis is limited.
Economic analysis quality scores: 3, 0, 0, respectively.

Sable et al, 1999. The study analyzed costs of live transmission of neonatal ECGs from underserved areas and compared them to saved transportation costs (helicopter and doctor). The study showed that the videoconferencing system was accurate and that it saved five unnecessary transportations to tertiary hospital. The study did not include a proper economic analysis. A short calculation showed that the value of saved transportations was higher than the telehealth investment costs plus telecommunication costs.
Economic quality score: 0

Tsilimigaki et al, 2001. These preliminary study results suggest that a telehealth system for congenital heart disease in children may be cost-saving from the perspective of patients' families and society. However, the cost analysis was very limited.
Economic quality score: 0

Summary of Paediatric studies

The economics of Paediatric telehealth applications was analyzed mainly from a health care provider or patient/parental perspective. From the health care perspective, the cardiologic consultations seem to be cost saving (at least after certain workload), partly because the investment cost to the system is not high, and the costs of transporting and caring for neonates in intensive care units are very high. From the patients/parents perspective, Paediatric specialist and Paediatric congenital heart disease consultations can be cost-saving for patients' families.

The quality of the economic studies was poor, since the studies fulfilled only 0 to 3 quality criteria. This means that although the results can give some initial information about the magnitude of the costs and possible cost savings, the results cannot be fully used in actual decision-making due to the likely bias of results in both directions.

First Nations

There are no economic studies of First Nations telehealth applications. Since many of these communities are rural and remote, the economic analysis in the Rural and Remote Telehealth chapter is most applicable to these patients. However, First Nations populations may have some specific socio-economic, cultural and epidemiological characteristics that might also influence the economic analysis of telehealth in this patient population. More research in this area is urgently needed.

Geriatrics

Disease Management Advisor article (Anonymous, 2001). The article describes a disease management solution for ill seniors. Sixty-two seniors were divided into an Internet-based intervention group, an interactive voice response (IVR) group, and patients who received usual care. No real economic analysis was described. However, the article shows that cardiac costs decreased US$246.52 per member per month in internet group and US$264.93 per member per month in IVR group. In the conventional care group, cardiac costs rose by US$134.87.
Economic quality score: 0

Riegel et al, 2002. This study examines the effect of a standardized nurse case-management telephone intervention on resource use in patients with chronic heart failure. Some of the post-discharge follow-ups were replaced by nurse telephone calls. It was found that for heart failure patients this treatment had significant outcome effects by reducing heart failure hospitalization. It had a significant impact on the reduction of acute care costs per patient (about US$1000), while the cost of the program per patient was US$443. This study included only health care costs, although it is difficult to define all the costs used in the study. The study demonstrates the potential clinical and economic benefits of telephone follow-up for chronic conditions.
Economic quality score: 4

Subirana Serrate et al, 2001. This cost-minimization analysis of oncology patients looked at two groups: those who were hospitalized at home when possible and had access to 24 hours telephone support, versus those who received hospital care. All direct variable medical care costs were provided by health insurance companies (health care perspective). The total home care cost was 64% of that of hospital care (difference not significant). The cost minimization analysis showed significant cost savings for oncology patients nursed at home with telephone support. Telephone-supported homecare was recommended. (This study also included in tele-homecare section.)
Economic quality score: 4

Specht et al, 2001. The article is a cost-minimization analysis of a pilot telemedicine chronic wound consultation clinic, from the point of view of gerontological nursing. The perspective of the study was mainly that of the health care system, although some patient costs were discussed. The average cost of a telehealth chronic wound consultation was US$136.16 versus US$246.38 for face-to-face consultation, including patient transportation. The opportunity cost of lost working time in the option where specialized nurse travels to see the patient was high (12 patient consultations missed). Telehealth cost savings are demonstrated. (This study also included in rural/remote telehealth section.)
Economic quality score: 5

Summary of geriatric studies:

The geriatric studies employed mainly a health care perspective in the economic analysis. The quality of the few studies found in the field was weak to moderate. The results show that the telephone can be a cost saving method of providing medical advice to geriatric patients due to reduced use of hospital /nursing home services. In the long-term care setting the utilization of videoconferencing for chronic wound consultations was also seen as cost-saving since both the transportation of chronically sick geriatric patients and visiting of specialists at long-term facilities are relatively expensive alternatives to videoconferencing. Because the evidence is based on relatively few economic studies with low or moderate quality, these results can be considered to be tentative. There is a need for more studies to confirm these results, e.g., in Alberta.

Tele-homecare

Dansky et al, 2001. A randomized study of 171 diabetic patients compared groups that did (n=86) or did not (n=85) have video visits in addition to skilled nursing visits. The study analyzed the homecare costs only and showed that, while tele-homecare imposes additional expenses for care delivery, it contributes substantial savings without compromising quality. Additionally, they found that the financial benefits increase as the duration of the patient episode increases. Therefore telemedicine is recommended.
Economic quality score: 8

Dawson et al, 1999. This study analysed domiciliary midwifery support in high-risk pregnancy incorporating telephonic fetal heart rate monitoring (randomized trial). They used the societal perspective, including all relevant costs that varied between the studies. It was demonstrated that substituting conventional visits with midwifery visits, including telehealth, saved 223.83 UK Pounds. This was due mainly to decreased antenatal visits and inpatient care, and decreased lost working time of the women and their partners. Telehealth was recommended.
Economic quality score: 7

Doolittle, 2000. In this study the costs of tele-hospice and conventional home-based hospice service were compared. The study concentrated on hospice service related costs only, excluding possible costs to patients and their families. In two three-month periods the cost of conventional hospice service were US$126 and US$146 per visit, respectively. During the second three-month period tele-hospice services were also provided, and they cost US$29 per visit. The US Medicare reimbursement rate was US$100 per day in hospice care. The study concluded that tele-hospice services may increase the efficiency of hospice services, especially in rural areas where nurses have to travel long distances to see patients. By replacing at least part of the services with tele-hospice services, they can provide more services or see patients more frequently. Further research is needed to define clearly the role of tele-hospice service in Canadian health care system. (Study also included in rural / remote telehealth section.)
Economic quality score: 4

Johnston et al, 2000. This randomized tele-homecare study used videoconferencing visits and gave homecare patients access to a home health care nurse 24 hours a day in addition to conventional homecare services. The control group got the same conventional services as before. Quality of care and patient satisfaction were good. Telecare was more expensive than conventional care (USD1830 vs. USD1167 respectively), but the other health care costs were lower in the telehealth group compared to the control group (US$1948 vs. US$2674, respectively). Tele-homecare can be an asset for patients and providers.
Economic quality score: 4

Subirana Serrate et al, 2001. This cost-minimization analysis of oncology patients looked at two groups: those who were hospitalized at home when possible and had access to 24 hours telephone support, versus those who received hospital care. All direct variable medical care costs were provided by health insurance companies (health care perspective). The total home care cost was 64% of that of hospital care (difference not significant). The cost minimization analysis showed significant cost savings for oncology patients nursed at home with telephone support. Telephone-supported homecare was recommended. (Study also included in Geriatrics telehealth section.)
Economic quality score: 4

Summary of tele-homecare studies

The studies in tele-homecare involved several different patient groups (e.g., diabetic patients, oncology patients). They all introduced a new telemedicine service to replace either patients' hospital visits or the homecare visits of health care staff. The economic analysis showed that telehealth applications are as costly or cheaper than conventional alternatives. Only one of the studies used the societal perspective in the analysis, which indicates that some analyses may be underestimating the real societal costs and savings of these alternatives. The economic quality score values of the studies were moderate or good.

Although there is evidence that tele-homecare services can be cost-saving, more studies in the field are needed to confirm these results in Canada and Alberta.

Tele-mental health

Elford et al, 2001. The study evaluated the costs of telepsychiatry services and conventional alternatives where a child and his parents traveled to psychiatric consultation in St John's (670 km). However, parents' lost working time and other domestic costs were not included in the study. This pilot study found that the telehealth alternative was cost-saving as compared to the conventional alternative, only when ten or more patients per month were consulted. If nine patients per month were consulted, then the conventional alternative became more economical. Although the cost analysis is not complete, it demonstrates the importance of including patients'/families' travel and hotel costs when patients are coming from remote places.
Economic quality score: 4

Mielonen et al, 2000. In this Finnish study, patient care planning negotiations were made using videoconferencing between the patient's home community health center and University Hospital where the patients were in the ward. The study showed that telepsychiatry can be cost-saving on relatively low patient workloads (less than 30 patient per year). The study used a societal perspective. Some of the meetings would not have been possible to arrange without telehealth because of the consequence of lost working for health care staff in the conventional alternative.
Economic quality score: 6

Schopp et al, 2000. In this study, 49 neuropsychology patients were interviewed using videoconferencing and 49 matched controls had face-to-face neuropsychological assessment. Telehealth clients were more likely to want to repeat their experience. Calculating mainly the psychiatrist and patient travel cost, they concluded that the telehealth alternative was significantly less expensive than in-person consultation costs (either in university hospital or outreach). Videoconferencing costs were not specified in any detail.
Economic quality score: 3

Simon et al, 2000. The aim of this randomized study was to assess whether feedback to physicians or feedback plus telephone care by case managers improve outcomes in patients treated for depression. The authors constructed a cost analysis of the alternatives using health care and patient costs. They found that the incremental cost of feedback plus care management by telephone was US$85 per patient.
Economic quality score: 6

Simpson et al, 2001 (a,b); Doze et al, 1998, 1999. This Alberta project analyzed telepsychiatry services from both the provider and patient perspectives. The cost analysis showed that, compared to travelling to larger centres, telepsychiatry become cost-saving after 348 consultations per year. If the use of the videoconferencing equipment for administrative purposes is included in the calculations, the break-even point was 224 consultations per year. The calculation of patient costs showed that patients had significant savings from the use of telemedicine due to decreased travel and child care costs, and lost working time. Telehealth is likely to be beneficial from the societal perspective even in workloads lower than 224 consultations per year.
Economic quality score from articles altogether: 7

Tang et al, 2001. The study examines the use of telepsychiatry in psychogeriatric service. Psychogeriatric services were provided via videoconferencing in the city of Hong Kong for 149 patients. The cost analysis used a health care perspective and it showed that even within the city area the telehealth alternative was 13.2% cheaper than conventional care where the psychiatrist travelled to the consultation. The main reason for the low cost of telehealth was that the same equipment was used for other geriatric services, so the share of costs allocated to psychiatry was small.
Economic quality score: 5

Trott and Blignault, 1998. In this study a brief cost comparison was made for telepsychiatric services between an isolated Australian mining town and regional centre (distance 900 km). The savings to health authorities were estimated to be AU$85,380 in the first year, and AU$112,790 in subsequent years due to the high travel costs of the patients and psychiatrists. In addition, they estimated to have AU$96,336 annual savings in the emergency flights (27 patients). The study showed considerable savings from reduced travel by patients and health care workers. (This study also included in rural/remote telehealth section.)
Economic quality score: 2

Summary of tele-mental health studies
In most cases, there were cost savings associated with the tele-mental health applications. In instances where the patients (and their caregivers) or health care professionals have to

travel long distances for services, the break-even point where the telehealth alternative becomes cost-saving can be relatively low. In some cases telepsychiatry is the only feasible/economical way of delivering mental health services to rural and remote places. The inclusion of patients' and caregivers' travel costs is important in decision-making, since specialized psychiatric services (e.g., in Paediatrics) are generally only available in big cities.

The quality of the economic studies ranged between 2 and 7 on the Drummond scale; however, in general, the economic quality of the studies in tele-mental health was among the highest of all the subject areas in this review. Many of the study results are applicable to the Alberta health care environment.

Teleradiology

Bailes et al, 1997. The study estimates cost savings of a wide-area telehealth network for neurological consultations in the US (Pittsburgh area). They prospectively reviewed 100 consecutive neurosurgical teleconsultations. Thirty-three patients avoided transportation to tertiary hospital due to teleconsultations. It was estimated that US$502,638 was saved in hospitalization and transportation costs (health care system perspective). The study concluded that the telehealth has led to more appropriate transfer of patients to the tertiary facility as well as significant estimated cost savings. (Study also reviewed in rural/remote telehealth section.)
Economic quality score: 1

Bergmo, 1996. The study examines the economic analysis of teleradiology versus a visiting service. It showed that the teleradiology service (6000 patients) between the local hospital without radiologist and University Hospital cost NKr108 per patient, while the cost for a visiting radiologist service was NKr178 per patient. Teleradiology becomes cheaper after the workload exceeded 1576 patient per year. If a shorter lifetime of the teleradiology unit were assumed (four years instead of six years), the threshold value would increase to 2320 patients per year. This study uses the health care system perspective.
Economic quality score: 8

Bracale et al, 2002. This article deals with telehealth services for two islands in the Bay of Naples. Most of the patients were radiology patients. The study used a health care provider perspective in its analysis. The fixed costs of the system were EUR 48,000 per year and the variable costs were EUR 750 per year. The total savings due to telehealth service was EUR 40,000 per year. Therefore there was little difference in the overall cost of health care delivery. The authors recommend telehealth for isolated islands; however, the strength of the study results is weak.
Economic quality score: 2

Brumage et al (2001) examine the use of teleradiology in a US military training area (Hawaii). Their cost calculations showed that during the first one-year period the estimated savings would be US$176,540 and the cost of teleradiology was US$167,203. Over five years the costs and savings were estimated to be US$349,940 and US$882,700,

respectively. The study was relatively well conducted, but the perspective of the study is military medicine, so it cannot be directly applied to other health care systems.
Economic quality score: 8

Davis 1997. This study is an economic analysis of teleradiology systems in private rural imaging centers that analyzed MRI images. At an expected case-load of 200 per year, a mid-field MR unit was predicted to cost US$470 per case using teleradiology, and US$ 544 per case using film and a courier service (health system perspective).
Economic quality score: 4

Halvorsen & Sonbo Kristiansen, 1996, 1997. The study is a cost-minimization model that compared three alternatives. The existing system (small x-ray unit at the remote site) was compared with all other examinations at the nearest radiology department, teleradiological services, and visiting specialist services. After excluding costs common to all three alternatives, the direct medical, direct non-medical (travel) and production lost costs for these alternatives were (in pounds) 91,500,123,500, and 117,00 for the alternatives, respectively. Sensitivity analysis showed that the existing system was the least costly option with the exception of when lost leisure time is valued as lost production. The study takes the perspective of both the health care provider and society. The data is fairly old (1993), so may not be applicable today.
Economic quality score value: 8

Maas et al, 2000. This study compares the transportation savings and medical benefits of a tele-neurological network between Turku University Hospital in Finland and three regional hospitals. From 83 teleconsultation patients, 81% of them avoided unnecessary transportation and saved overall EUR 42,100. Consulting digital CT scanner (and MRI scanner) images between hospitals can be cost-saving since the system doesn't require high investment costs.
Economic quality score of the study: 2

Stoeger et al, 1997. The cost analysis of an emergency CT teleradiology system between a regional hospital and University Hospital in Innsbruck, Switzerland, is examined. Using ISDN connections, the average cost of one emergency CT examination by teleradiology was DM372 (range 308-453). Using a slower taxi transportation would cost DM156. Transportation of the patient to the nearest central hospital was more expensive: DM524 by road or DM4667 by helicopter ambulance. The authors recommend the implementation of an emergency CT service in the remote hospital, because it offers benefits to emergency patients and cost-efficient operation is possible.
Economic quality score: 4

Walz et al, 1999. The study examined a teleradiology system in Germany that transferred CT examinations via ISDN lines. Videoconferencing was used to contact the on-duty radiologist. From the two scenarios calculated in the study, teleconsultation began to be cost-saving for health care system after 1817 patients, or 528 patients per year. The system was seen to be expensive under current conditions, and cost-saving only under the most favourable conditions in the cost analysis (health care system perspective). This study is not considered to be applicable to Alberta.
Economic quality score value: 6

Summary of teleradiology studies:

The studies in teleradiology show that cost savings do occur in several different areas of application. The most convincing evidence is found in teleneurology / teleneurosurgery, involving the transmission of CT and MR images. In some settings, cost savings do occur when transmitting x-ray images, if workload and distances are great enough. The studies show cost savings both in the consultations between primary and secondary care and between specialty consultations. The cost analysis was primarily from the perspective of the health care sector. The economic quality of the studies ranged from 1 to 8. It is likely that there are some teleradiology applications that are economically feasible in Alberta.

Tele-ultrasound

Malone et al, 1998. This study analyzed the costs of the use of computerized telemedicine for obstetric ultrasonography. This US-based study included a network of one specialized tertiary level clinic and three local physicians' offices with a monthly workload of 600 obstetric ultrasound examinations. The real-time video-based telehealth alternative proved to be an economically sustainable solution when compared to couriering the recorded ultrasound examination to a specialized clinic (distances not specified). Telehealth alternatives saved in the printing of the images to paper, couriering costs and in repeated examinations due to low-quality images on tape. The study included only main health care costs (ignoring, for example, patients' travel and lost work time due to extra examinations in conventional care). For the health care provider, the telehealth system paid the investment cost back in 12 to 14 months. Because the direct electronic communication also reduces the use of secretarial work (cost not included in the study), the current estimates probably overstate the actual pay-back time of the investment. (This study also included in rural/remote telehealth section.)
Economic quality score: 5

Summary of tele-ultrasound studies

Only one economic study from ultrasound was found in the search. The transmission of ultrasound images utilizes videoconferencing technology. This means that the incremental cost of sending ultrasound images is not high, especially if one or both sites already have videoconferencing equipment. The study by Malone et al (1998) included a telemedicine network of obstetric services with a relatively high frequency of examinations per month (200 per site). With a lower patient volume the pay-back time of the investment would be longer. If conventional services are provided by visiting a specialist, the high travelling costs may make the telemedicine alternative cost-saving given a relatively low number of examinations per year; however, there was no cost calculation of this alternative.

Renal dialysis

The review did not find any good economic studies related to renal dialysis. Telehealth applications in renal dialysis are mostly videoconferencing connections between satellite clinics and university clinics. The connections are used to supervise and monitor the care given in the satellite clinics, and to give specialized care consultations to satellite care patients in specific renal dialysis related conditions. There are also telehealth applications in home dialysis care, although they do not include proper economic analysis. The economic issues around renal dialysis cooperation via telehealth are significant, since patients require treatment several times per week. Problems in care may lead to substantial additional costs in ambulatory care with ambulance transportations and hospitalizations. More analysis is needed in the area to demonstrate cost-effective methods of maintaining high quality renal dialysis care in remote and rural satellite units and home dialysis.

Rural/Remote Telehealth

Agha et al (2000) conducted a cost-minimization analysis of telehealth for delivery of pulmonary outpatient care to a rural site in the US. This abstract shows that the telehealth outpatient consultation was cost-saving compared to patients' visit at the rural hospital (including 450 mile round-trip, lost productivity and one hotel night). The annual costs were US$441 per patient manager by telehealth and US$540 per conventional care patient (societal perspective). From a health care provider perspective the telehealth alternative was US$37 more expensive than outpatient clinic visit. The authors concluded that telehealth is a cost-effective way of delivering pulmonary outpatient care to a remote area with limited access to care.
Economic quality level: 4

Bailes et al, 1997. The study estimates cost savings of a wide-area telehealth network for neurological consultations in the US (Pittsburgh area). They prospectively reviewed 100 consecutive neurosurgical teleconsultations. Thirty-three patients avoided transportation to tertiary hospital due to teleconsultations. It was estimated that US$502,638 was saved in hospitalization and transportation costs (health care system perspective). The study concluded that the telehealth has led to more appropriate transfer of patients to the tertiary facility as well as significant estimated cost savings. (This study also reviewed in teleradiology section.)
Economic quality score: 1

Bergmo, 1997. An economic analysis of teleconsultations in otorhinolaryngology in Northern Norway showed that telehealth was cost-saving as compared to conventional patient visits to the University Hospital (distance 400 km). The cost savings occurred after 56 patients per year, and visiting ENT specialist service began to be cost-saving over telehealth after 325 patients per year. If the primary care doctor learning effect during the video-consultations was taken into consideration, telehealth began to be cost saving after 52 patients per year.
Economic quality score: 7

Bergmo, 2000. The study shows results of a cost-minimization analysis of real-time teledermatology services in northern Norway. The costs of teledermatology when using videoconferencing were compared to three alternatives.

1. specialist visits a health centre and patient travels to hospital for treatment,
2. patient travels to the nearest secondary care centre,
3. locally employed dermatologist.

At the 1998 workload of 375 patients, the total cost of teledermatology was NKR470,780 while the three alternatives cost NKR880,530, NKR1,635,075 and NKR958,660, respectively. Break-even analysis showed that real-time teledermatology, including local phototherapy, was less costly than the three alternatives for annual number of patients over 195. Sensitivity analysis showed that the results were robust to changes in cost variables. In summary, real-time teledermatology can be cost-saving and it can enable wider local dermatological care in the supervision of dermatologists.
Economic quality score: 8

Della Mae et al, 2000. This short economic study compares the costs of telepathology services in a mountain hospital to three conventional alternatives: visiting pathologist, ambulance transfer of frozen section to main hospital, and service of own pathologist. Ambulance service is cost saving up to 73 patients per year; however, the prolonged operation times may increase the costs of this alternative. Telepathology is least costly after 73 patients per year. The analysis was done from a health care sector perspective. The study did not include most of the important details of cost analysis, hence the validity and reliability of the study results cannot be guaranteed.
Economic quality score: 1

Doolittle et al, 1997. This cost analysis compares a tele-oncology practice to fly-in specialist outreach services to rural hospital in the US. The data is somewhat dated (May 1995 – April 1996). The results show that during the one-year period 184 patients were seen (56% tele-oncology and 44% outreach). The health care cost of telecare was US$ 812 and outreach clinic visit US$897. If the patient had visited the university hospital, the clinic cost without traveling costs would have been US$149. The study summarizes that the costs of telehealth alternatives were only 10% lower than fly-in outreach consultations. The new practice provides the oncology services to many patients that would not otherwise have received specialist services.
Economic quality score: 4

Doolittle, 2000. In this study the costs of tele-hospice and conventional home-based hospice service were compared. The study concentrated on hospice service related costs only, excluding possible costs to patients and their families. In two three-month periods the cost of conventional hospice service were US$126 and US$146 per visit, respectively. During the second three-month period tele-hospice services were also provided, and they cost US$29 per visit. The US Medicare reimbursement rate was US$100 per day in hospice care. The study concluded that tele-hospice services may increase the efficiency of hospice services, especially in rural areas where nurses have to travel long distances to see patients. By replacing at least part of the services with tele-hospice services, they can provide more services or see patients more frequently. Further research is needed to define clearly the role of tele-hospice service in Canadian health care system. (This study also included in tele-homecare section.)
Economic quality score: 4

Malone et al, 1998. This study analyzed the costs of the use of computerized telemedicine for obstetric ultrasonography. This US-based study included a network of one specialized tertiary level clinic and three local physicians' offices with a monthly workload of 600 obstetric ultrasound examinations. The real-time video-based telehealth alternative proved to be an economically sustainable solution when compared to

couriering the recorded ultrasound examination to a specialized clinic (distances not specified). Telehealth alternatives saved in the printing of the images to paper, couriering costs and in repeated examinations due to low-quality images on tape. The study included only main health care costs (ignoring, for example, patients' travel and lost work time due to extra examinations in conventional care). For the health care provider, the telehealth system paid the investment cost back in 12 to 14 months. Because the direct electronic communication also reduces the use of secretarial work (cost not included in the study), the current estimates probably overstate the actual pay-back time of the investment. (This study also included in tele-ultrasound section.)
Economic quality score: 5

Massman et al, 1999. The regional Hospital Burn Centre completed 87 follow-up visits with 40 patients via videoconferencing. Patients were seen in 15 sites in six US states. Teleconsultations saved patients money but were more time consuming for the physician and therapist. Remote sites became more efficient in presenting their patients during the program. The program increased access for rural patients and their doctors to specialist burn consultations and improved the regional network.
Economic quality score: 1

Specht et al, 2001. The article is a cost-minimization analysis of a pilot telemedicine chronic wound consultation clinic, from the point of view of gerontological nursing. The perspective of the study was mainly that of the health care system, although some patient costs were discussed. The average cost of a telehealth chronic wound consultation was US$136.16 versus US$246.38 for face-to-face consultation, including patient transportation. The opportunity cost of lost working time in the option where specialized nurse travels to see the patient was high (12 patient consultations missed). Telehealth cost savings are demonstrated. (This study also included in geriatric telehealth section.)
Economic quality score: 5

Trott and Blignault, 1998. In this study a brief cost comparison was made for telepsychiatric services between an isolated Australian mining town and regional center (distance 900 km). The savings to health authorities were estimated to be AU$85,380 in the first year, and AU$112,790 in subsequent years due to the high travel costs of the patients and psychiatrists. In addition, they estimated to have AU$96,336 annual savings in the emergency flights (27 patients). The study showed considerable savings from reduced travel by patients and health care workers. (This study also included in tele-mental health section.)
Economic quality score: 2

Summary of Rural/Remote Telehealth studies:

Rural and remote telehealth applications involve several different specialty areas that utilize different technologies, hence they are difficult to compare and summarize. Generally, the studies showed that it is economically feasible and in most cases cost effective to use telehealth in rural/remote consultations. However, that conclusion cannot be applied to all rural sites and to all specialties in Alberta and northern territories, since some of the studies involved considerably greater volumes of patients than are present in parts of rural or northern Alberta. If health care provider costs only are included, the telehealth alternative is not always cost-saving. However, if patients' travel and lost working time are included, many of the telehealth alternatives become cost-saving from a societal perspective. In addition, it is very difficult to measure the value of increased access to care, equity in health, and the value of health care staff education during consultations to remote and rural areas.

The quality of economic studies in the field varied greatly (between 1 and 8). More economic studies are needed that are specially connected to the rural/remote environment in Canada and Alberta since there may be some variation as compared with the US or UK environments.

Tele-rehabilitation

The review did not identify any economic studies related to rehabilitation. The volume of telehealth applications in rehabilitation is increasing in Canada and elsewhere, hence there is an urgent need for economic assessment in this field.

SUMMARY AND CONCLUSION

This review study has identified many telehealth applications in a variety of subject areas that have proven socio-economic benefit to patients, providers, the health care system and society as a whole. Certainly many of these telehealth programs can be seen as applicable to the Canadian and Alberta environments, and these have been identified in the chapters. The nine socio-economic areas of benefit that were referenced most often in the literature were access to care and services, costs or cost-effectiveness, education, support, social isolation, patient/provider satisfaction, health outcomes, quality of care and quality of life. Table C.1 provides a count of studies within each subject area which provided good to fair scientific evidence for the benefit of telehealth as compared with conventional care.

Table C.1 Areas of Benefit of Telehealth Applications

Areas of Benefit:		1	2	3	4	5	6	7	8	9
Subject Area	*Number of studies providing Good to Fair evidence**	*Access*	*Cost / CE / Decreased health services utilization*	*Education*	*Support*	*Social Isolation*	*Acceptability / Satisfaction*	*Health Outcomes*	*Quality of Care*	*Quality of Life*
Geriatrics	16	8	6	3	4		6	3	2	
Paediatrics	24	3	9	1	3	1	2		3	3
First Nations	2			1						1
Telerehabilitation	5		2	1			2		1	3
Tele-Mental Health	16	2	2	3	3	1	2		3	1
Teleradiology	30	10	15					1	3	
Rural / Remote	7		1	1			4		1	1
Tele-Homecare	9	1	6				4		2	2
Renal	0									
Systematic Reviews	17	3	4				4	4	2	

* Note: this denotes the number of studies within each subject area which demonstrated Good to Fair scientific evidence based on the 1995 Jovell/Navarro-Rubio rating scale – a 5 point scale including the ratings: Good, Good-Fair, Fair, Fair-Poor, Poor (Hailey et al, 2002).

There are certain telehealth applications that have proven significant socio-economic benefit. In the Telehealth Reviews chapter, systematic reviews by Hailey et al (2002) and Roine et al (2001) found the most evidence of efficacy and efficiency for telehealth in the following areas of application: teleradiology (i.e., CT transmission), tele-mental health, ECG transmission, teledermatology, tele-homecare and some medical consults. Hersh et al (2001) found that videoconferencing, self-monitoring and store-and-forward technologies can improve access to care, quality of care, and/or clinical outcomes, in their review studies of Paediatric, Obstetric and home telehealth studies.

The most evidence for economic efficiencies, outlined in the Economic Analysis chapter, was in the areas of home telehealth, tele-mental health, teleradiology, and rural and remote telehealth. Examples of proven economic applications include:

- Videoconferencing between a tertiary site and a remote health centre/clinic, nursing home, or private home;
- Telephone-based assessment, care, and/or follow-up, sometimes supplemented by technologies such as decision support;
- High-speed data transmission; i.e.: radiological images, echocardiograms, or other patient data.

However, the study did not find any consistency in identification or application of social or economic indicators within, or between, studies in any subject area. This finding highlights a critical gap in our current research process and capabilities. In order to better define key areas of socio-economic benefit for further study, policy makers need to be engaged and, importantly, so does the public as a whole. Resources can then be directed to initiatives where telehealth can have the greatest impact on the health and well-being of the population.

Given the evidence that exists, specific, program area recommendations are provided regarding key directions for telehealth in Alberta and Canada. However, sound evaluation of new initiatives must be a component of any project, and avenues must be opened so that innovative solutions can be tested. Therefore, general recommendations pertaining to policy, technology, evaluation, and economic analysis are also provided in this study.

Given today's information and communications technology and telecommunications environment, there is significant potential for the expansion of telehealth and realization of substantial benefits to patients and all stakeholders in the health care system within the next decade.

Socio-Economic Impact of Telehealth: Evidence Now for Health Care in the Future

Volume Two: Policy Report

A report prepared by the
Health Telematics Unit,
University of Calgary

31 October 2002

Funded by the
Alberta Heritage Foundation for Medical Research
State of the Science Review Program

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I EXECUTIVE SUMMARY

Telehealth has become widespread in the last two decades, despite the generally poor scientific evidence available to support its use. This study was undertaken to contribute to the Alberta Heritage Foundation for Medical Research (AHFMR) 'State of the Science Reviews' program, and provides an information base to assist policy- and decision-makers, and researchers, in their deliberations about telehealth.

Telehealth, telemedicine, or e-health is defined as "the use of information and communication technology (ICT) to deliver health services, expertise and information over distance, geographic, time, social and cultural barriers." Telehealth encompasses Internet or web-based "e-health", as well as video-based applications. Applications can be real-time or store-and-forward.

This report summarizes the health services scientific literature on telehealth. Based upon a comprehensive literature search and a critical review and appraisal of that literature, the report provides an overview of the areas of strength and weakness in the telehealth research base, identifies gaps in the existing knowledge, and reviews policy implications. Specifically, this study addresses the following three research questions:

4. What is the socio-economic impact of telehealth as a method of delivery of healthcare and information, compared to that of the status quo? For patients and their families? For providers, programs, institutions and regional health authorities? At the provincial and national levels? For the public in general?
5. What are the optimal indicators and proxy indicators for the assessment of the impact of telehealth?
6. What are the related recommendations for policy and decision makers?

The report consists of three volumes. Volume One describes the general areas of health benefit supported by proven telehealth applications from the literature. Volume Two summarizes the related policy implications and recommendations, and Volume Three provides appendices that summarize the literature and support Volumes One and Two.

1. Socio-economic impact of telehealth

Telehealth has been found to offer important quality of life, health, and socio-economic benefits to the people of Alberta and Canada and to reduce costs and utilization of the healthcare system.

Based upon existing literature, a total of 14 social determinants of health or socio-economic performance indicators for a community were identified for this study. Of these, the study identified nine areas of socio-economic benefit as most prominent in the telehealth literature: Access, Cost / Cost Effectiveness / Decreased Health Services Utilization, Education, Support, Social Isolation, Acceptability / Satisfaction, Health Outcomes, Quality of Care, and Quality of Life. Ten subject areas, representing the most promising areas of telehealth application, were identified for study: Geriatrics, Paediatrics, First Nations, Telerehabilitation, Tele-mental health, Teleradiology, Rural / Remote, Tele-homecare, Renal, and Systematic Reviews of telehealth. Using only those studies that provided a 'strength of evidence' ranging from 'Good' to 'Fair', Table E1 highlights those subject areas within which these socio-economic benefits have been found within this evidence framework. It can be seen that Paediatrics and Tele-mental health offer the most socio-economic benefits, whereas Renal Dialysis appears to offer none. The use of telehealth for Renal Dialysis does offer socio-economic benefits, but, to date, the literature review did not offer adequate quality of evidence. This reveals a gap in our current research base that requires further attention.

The benefits summarized in Table E1 accrue to one or more of the public, patient, family, providers, programs, institutions, or regional health authorities, as well as to the healthcare system at provincial, territorial, and national levels.

Table E.1 Areas of Benefit of Telehealth Applications

Areas of Benefit:		1	2	3	4	5	6	7	8	9
Subject Area	*Number of studies providing Good to Fair evidence**	*Access*	*Cost / CE / Decreased health services utilization*	*Education*	*Support*	*Social Isolation*	*Acceptability / Satisfaction*	*Health Outcomes*	*Quality of Care*	*Quality of Life*
Geriatrics	16	8	6	3	4		6	3	2	
Paediatrics	24	3	9	1	3	1	2		3	3
First Nations	2			1						1
Telerehabilitation	5		2	1			2		1	3
Tele-Mental Health	16	2	2	3	3	1	2		3	1
Teleradiology	30	10	15					1	3	
Rural / Remote	7		1	1			4		1	1
Tele-Homecare	9	1	6				4		2	2
Renal	0									
Systematic Reviews	17	3	4				4	4	2	

* The five-point rating scale used included the following categories: Good, Good to Fair, Fair, Fair to Poor, and Poor, in terms of scientific evidence. The articles enumerated here rate between Good and Fair.

Twelve common themes emerged from the analysis, which together form the basis for recommendations that will ensure appropriate development of telehealth in the future.

- *A need exists for policy development.*
- *Policy leadership will greatly facilitate the use and integration of telehealth.*
- *Increased awareness and understanding of telehealth opportunities is needed.*
- *Increased connectivity to rural and remote communities is required.*
- *Many potential benefits exist for video consultation, including access, patient satisfaction, and cost savings.*
- *Strong evidence is lacking regarding the impact of telehealth on health services and human resource outcomes.*

- *Other than cost, access, satisfaction, and quality of life, extremely few true socio-economic indicators have been addressed.*

- *Telehealth provides benefits to patients and their families such as improved access to health services, avoidance of travel, and more rapid provision of care.*

- *There is an economic benefit in avoiding transfers to specialist centres and providing teleconsultations in some areas.*

- *Telehealth can save time for staff and save time data transfer.*

- *Telehealth can enhance educational opportunities for health care providers, patients, and families, improving clinical outcomes and reducing hospitalization.*

- *Simpler technology, such as the telephone, can be used successfully for patient assessment, triage, monitoring, reminders, or direct intervention, and can provide positive socio-economic benefit.*

2. Optimal indicators and proxy indicators

A variety of outcome measures have been documented in the literature (access, quality of life, satisfaction, cost), but no studies clearly identified or defined specific socio-economic indicators of outcome. At this time there is no agreement on which quantitative or qualitative measures (i.e. outcome indicators) are appropriate, or of most value, when evaluating telehealth applications. The 'areas of benefit' identified for this study are based upon accepted determinants of health, but these are not as yet reflected as formal indicators in the telehealth literature. This study found no consistency in the identification or application of such indicators within, or between, studies in any subject area. As a result there is uncertainty as to the general applicability of some study data, and direct comparison of one study with another may be misleading. This finding highlights a critical gap in our current research process and capabilities. Appropriately focused research questions and designs, validated instruments and defined quantitative or qualitative measures are required.

3. Recommendations for policy and decision makers

Based upon the evidence available, this study identified several general and subject specific recommendations. Subsequent review found them to be congruent or complementary to Alberta and Federal health reform initiatives described in anticipated (Romanow) and recent (Kirby; Mazankowski) reports, each of which call for change and reform, not maintenance of the current structure.

Saskatchewan premier Roy Romanow will release his findings in late November, 2002 (Commission on the Future of Healthcare in Canada). One finding in an interim report was that Canadians living in rural or remote areas frequently feel that they lack sufficient access to health services. To address this inequity of service one solution was to make "greater use of telemedicine and information technologies". The Interim report also leaned toward a recommendation for developing a national homecare strategy, noting that "supporters of a national approach suggest that enabling patients to receive more treatment at home will improve quality of care, relieve pressure on hospitals, and result in significant savings". Such a solution would be facilitated by telehealth.

Senator Michael Kirby's 11-member committee recently released the first of two major studies of the healthcare system in Canada. This report identifies securing timely access to care as being critical, along with the need for investment in health information technology. Also, one recommendation from this report is that post-acute homecare and palliative homecare be expanded, two areas where telehealth has been demonstrated as valuable.

The recent Report of the Premier's Advisory Council on Health (Mazankowski Report) provides a framework for reforming Alberta's health system. A review of the recommendations described in this report show many areas in which telehealth will have an impact. It is notable that of the 10 recommendations for reform, eight contain some element or specific recommendation related to telehealth or have relevance to telehealth policy. Examples include: providing Albertans with better information about how to stay healthy; reducing waiting times by introducing centralized booking, and posting waiting times for selected procedures on a website; investing in technology and establishing an electronic health record (EHR); providing long term funding for technology and information technology systems; continuing to support research, evidence-based decision making, and continuing Alberta's role as a leading centre of health and medical research. Little is said about policy, other than to note that some health decisions "… are not necessarily guided by the best information, but are instead made for a variety of reasons including past experience, expediency, political influences, or to comply with the wishes of health professionals or other health organizations". This underscores the importance and value of well-conceived policy.

General recommendations arising from this study are:

A. Policy

16. To be successful and sustainable, telehealth must be fully integrated into existing health structures and processes in a practical and policy manner.
17. Integration can be achieved through aligning telehealth initiatives with existing strategic health plans, policy goal-setting, accompanying action steps, and attention to policy barriers.
18. Establishment of a policy forum that focuses on telehealth policy would facilitate these needs.
19. Telehealth applications should incorporate capacity for education, research, and administrative functions, as well as health and clinical functions.

B. Technology

20. To facilitate access to many bandwidth intensive telehealth applications increased broadband connectivity is needed, particularly to rural and remote communities.
21. Given the evidence, the use of telephone-based telehealth applications should be re-examined.
22. Technology modalities (broadband, narrowband, web-based) and applications (videoconferencing, data monitoring, telephone) should be viewed as synergistic, not competitive, and the most appropriate tool applied; i.e., hybrid connectivity solutions are recommended.

C. Evaluation

23. Suitable outcome indicators, measures, and reliable and valid instruments for socio-economic benefit of telehealth must be identified, defined, and consistently applied within a recognized evaluation framework that asks relevant research questions.
24. Suitable frameworks for economic analysis need to be developed that capture non-monetary and unintended consequences, as well as monetary measures.
25. Telehealth programs should be implemented and evaluated in a culturally aware and culturally sensitive manner.
26. Evaluations should include examination of the social, organizational, and policy aspects of telehealth.

D. Economic

27. Telehealth demonstrates sufficient evidence of socio-economic benefit to indicate ongoing investment is appropriate.
28. Sustainable telehealth 'programs' and not 'projects' should be targeted.
29. Full integration of telehealth will increase its use and decrease the per contact episode cost.
30. Investment in information and communications technology infostructure should be considered as an investment not only in health, but in business, education, and other e-sectors.

E. Investment Opportunities

16. R & D and economic development opportunities require pursuit.

Subject-specific recommendations arising from this study are as follows:

Paediatric Telehealth

37. Telehealth programs that improve quality of care and offer economic benefit for 'at risk' paediatric populations (e.g., neonates, adolescent asthmatics) should be introduced.

38. Evidence would suggest decision makers should consider telehealth to achieve enhanced social environments for children, and staff efficiencies as related to data transfer.

39. The use of low-cost technology solutions (e.g., the telephone) is strongly recommended for Paediatric telehealth where appropriate.

Geriatric Telehealth

40. Telehealth programs should be used to support palliative home care initiatives.

41. Remote, wireless monitoring (e.g., personal alerts, caregiver and patient support, 'smart' homes and clothing) should be investigated for both enhanced independent living and geriatric healthcare applications.

42. Geriatric telehealth applications should be strongly considered as a technology R & D and economic development opportunity.

43. The use of e-prescription applications should be used to increase self-efficacy and compliance, and to reduce adverse effects.

44. The use of low-cost technology solutions (e.g., the telephone) is strongly recommended for Geriatric telehealth where appropriate.

First Nations Telehealth

45. The recommendations provided in the Health Transition Fund project report of 2001 should be implemented, viz:

    - Increase connectivity to rural and remote communities, and especially Aboriginal communities;

- Undertake new research further to implementation of successful telehealth initiatives in First Nations and Inuit communities, and regarding the impact of telehealth on costs, health services and human resources;
- Promote equality of opportunity for telehealth across First Nations and Inuit communities;
- Increase awareness and understanding of telehealth opportunities among First Nations and Inuit stakeholders;
- Create linkages between telehealth and other initiatives of the Aboriginal Health Infostructure in order to leverage investments.

46. Health services and information content should be delivered in a culturally sensitive context.

Tele-homecare

47. Telehealth should be considered for application in managing and monitoring chronic heart failure, chronic obstructive pulmonary disease, oncology, diabetes, wound care, asthma, anxiety, and cardiac vascular accident.

48. Home Telehealth programs should be used to assist with and transform the mode of delivery of home care. Such programs should be used to support change within the context of the continuum of care, and a comprehensive home healthcare program.

Tele-mental health

49. Tele-mental health, a proven and sustainable telehealth application, should be expanded.

50. The use of low-cost technology solutions (e.g., the telephone) is strongly recommended for tele-mental health where appropriate.

Teleradiology

51. Teleradiology, a proven and sustainable telehealth application in settings of appropriate workload and distance, should be expanded.

52. Teleradiology should be adopted in settings where the need to travel or poor speed of care provision present barriers to access.

Renal Dialysis Telehealth

53. Teledialysis should be evaluated more comprehensively before commitment is made.

Rural and Remote Telehealth

54. Increased access to a broad range of clinical and educational resources should be provided to rural, remote, and underserved populations.

55. Enhanced connectivity to rural and remote communities and residences should be a priority to improve economies of scale in future service and information delivery.

Telerehabilitation

56. Telerehabilitation, which has been demonstrated to show benefits for health care and patients (e.g., speech pathology, transtelephonic exercise monitoring) requires more comprehensive economic analysis.

Conclusions

Overall, valuable data and levels of evidence exist that support telehealth, and that can now be used by policy makers, decision makers, and researchers when making decisions specific to telehealth. These have been summarised in this report. However, evidence of high scientific quality for telehealth applications is still lacking. What has been clearly demonstrated is the feasibility of using telehealth in many clinical areas and for many health, clinical, educational, research, and administrative activities. Many of the same policy and research concerns, issues, and challenges in telehealth that are discussed in current sources existed 10 years ago. These issues should be addressed and decisions made.

Successful and sustainable implementation of telehealth exists when there is greater integration with other e-health initiatives, policy goal-setting, accompanying action steps, and attention to policy barriers. Benefits and successes often result when strategies and planning adopt human resource and user frameworks. For example, health and medical workforce and workflow are issues, together with readiness and ethical considerations. Collaboration, partnership and sharing are central to the advancement and sustainability of telehealth and its potential benefits, as are needs identification, risk assessment, enabling policy, and true public involvement.

Although project findings to date show broad benefits, these are generally associated with feasibility activity, and seldom measure the impact of telehealth on the social determinants of health, for example, poverty, social isolation, independent living, and identified needs of special populations. New evaluation and research activities should employ methodologies which enable the study of such factors. The reviewed literature suggests that the principle driving forces for telehealth have been financial, specialist clinical interest, and proof of technological feasibility. Patients' views and interests, social effects, quality controls and wider organizational effects are seldom considered. Our study shows that there are a growing number of evaluation frameworks for use by policy- and decision-makers when developing accepted evaluation approaches that could be consistently applied; for example, generic evaluation frameworks, benefit-cost analysis and consumer care pattern guidelines, as well as effects-oriented and risk analysis frameworks. These have been provided.

II INTRODUCTION

Telehealth has become widespread in the last two decades, despite the generally poor scientific evidence available to support its use. This study was undertaken to contribute to the Alberta Heritage Foundation for Medical Research (AHFMR) 'State of the Science Reviews' program, and provides an information base to assist policy- and decision-makers, and researchers, in their deliberations about telehealth.

Telehealth has been found to offer important quality of life, health and socio-economic benefits to the people of Alberta and Canada, and can reduce costs and utilization in the health system. This study describes the kinds of benefits that can be achieved and how. Specifically, this study addresses the following three research questions:

4. What is the socio-economic impact of telehealth as a method of delivery of healthcare and information, compared to that of the status quo? For patients and their families? For providers, programs, institutions and regional health authorities? At the provincial and national levels? For the public in general?
5. What are the optimal indicators and proxy indicators for the assessment of the impact of telehealth?
6. What are the related recommendations for policy and decision makers?

Telehealth, telemedicine, or e-health is defined as "the use of information and communication technology (ICT) to deliver health services, expertise and information over distance, geographic, time, social and cultural barriers"(Reid, 1996). Telehealth encompasses Internet or web-based "e-health", as well as video-based applications. Applications can be real-time or store-and-forward.

Socio-economic indicators include social determinants of health: poverty, social isolation, education, life stress, early life, access to transport, nutrition, access to health services and care, and factors affecting the socio-economic performance of a community: economy, labour markets, innovation, environment, education, health.

The context for this study is the Canadian health care environment with its particular characteristics, including universal access to health care, a population that is aging, widely dispersed (rural / remote), and diverse in composition with varying health needs (e.g., First Nations). Also implied in the study context is consideration of current strategic policy directions in the Albertan/Canadian health sector, such as the principles of providing care at the right time in the right place by the right provider, maintaining individuals' independence and community living, providing consumer choice, and trialling innovative projects in service delivery. These concepts, as well as the study investigators' experience and informed opinion regarding areas of promise for telehealth, led to the development of ten subject areas of focus for this study. These are:

11. Paediatrics telehealth
12. Geriatrics telehealth
13. First Nations telehealth
14. Tele-homecare
15. Tele-mental health
16. Teleradiology
17. Renal dialysis telehealth
18. Rural and remote telehealth
19. Telerehabilitation
20. Telehealth Reviews

A systematic review of the literature in each of these areas was undertaken, as well as a formal economic analysis of all pertinent articles within each subject area. In addition, a review of policy-related articles and sources was completed.

The study consists of three volumes:

Volume One: State of the Science Review. The State of the Science Review contains a summary of recommendations drawn from both reports, a description of the literature search strategy and the process established for selecting and reviewing sources, and a thorough analysis of the literature in each of the subject areas. It also includes an economic analysis, organized and summarized by subject area.

Volume Two: Policy Report. This report includes a summary of recommendations drawn from both reports, a summary of the results of the State of the Science Review, a description of the policy development process (awareness and engagement process as well as the review process for the policy articles/sources), and results of the policy review.

Volume Three: Appendices. This volume contains four issues of appendices supporting Volumes One and Two. The appendices include detailed information about the study process and a systematic review of all articles in each subject area, as well as all economic- and policy-related articles included in this study.

III TELEHEALTH POLICY BACKGROUND

In its broadest sense, health policy refers to decisions for determining present and future objectives pertaining to the health care system. But when endeavouring to clearly identify what constitutes specific policy there is diversity of opinion. For example, statements of where a particular jurisdiction *intends* to go with telehealth is not the same as legislation that *prescribes* where that jurisdiction will go. Somewhere between these two extremes lie standards, guidelines, and regulations.

Canada, and Alberta in particular, can be considered to have experienced considerable policy support for telehealth, but in terms of specific telehealth guidelines, regulations, or laws (e.g. addressing cross-jurisdictional licensing issues for healthcare professionals), little or no such policy exists. In general, remarkably few telehealth policy related documents or publications are available, and those that exist warn of the urgent need to address the issue.

This policy void is of concern. The introduction of any new technology that has the capability to permit easy cross-jurisdictional interaction, where previously there was little or none, will have profound impact on many health related policy issues. Telehealth, inherently, has the technical capability to transgress all existing geo-political, socio-economic, cultural, and temporal boundaries. As a consequence telehealth, if developed appropriately, offers unprecedented opportunity for increasing access and addressing issues of equity. However, achieving such goals is already being hampered and impeded by the lack of telehealth policy. Of greater concern is that introduction of hasty, uncoordinated, introspective, or restrictive policy could preclude cross-jurisdictional telehealth entirely.

1. Telehealth Policy in Alberta

Alberta Wellnet is most directly involved with telehealth activities, and is the umbrella for a series of province-wide and regional initiatives to build an integrated health information network in the province. Alberta is also a member of the Western Health Information Collaborative (WHIC). Initiated by the Western Premiers and Deputy Ministers of Health, WHIC exists to explore collaborative opportunities with respect to health infostructure initiatives, and might also serve as a nexus for collaborative policy development.

The most significant policy document for health in Alberta is the recent 'Mazankowski Report' and the Alberta Government's response. A review of the recommendations described in the Mazankowski Report shows many areas in which telehealth will have an impact. For example, of the ten groups of recommendations for reform, eight contain some element or specific recommendation related to telehealth or having relevance to development of telehealth policy. Examples would include: providing Albertans with better information about how to stay healthy; reducing waiting times by introducing centralized booking, posting waiting times for selected procedures on a website; investing in technology and establishing an electronic health record; providing long term funding for technology and information technology systems; continuing to support research, evidence-based decision making, and Alberta's role as a leading centre of health and medical research. Little is said about policy, other than to note that some health decisions "… are not necessarily guided by the best information, but are instead made for a variety of reasons including past experience, expediency, political influences, or to comply with the wishes of health professionals or other health organisations". This underscores the importance and value of well-conceived policy.

2. Telehealth Policy in Canada

Many telehealth initiatives are currently underway in Canada, both at a local and national level. Almost all federal, provincial and territorial governments across Canada have a strategic information systems initiative (e.g. HealthNet/BC, Alberta Wellnet, Saskatchewan Health Information Network, Smart Systems for Health, Inforoute Santé, Nova Scotia Telehealth Network).

Canada has enjoyed considerable policy debate and leadership with regard to telehealth. Our telehealth history formally began in 1994, when the Information Highway Advisory Council (IHAC; 1994-1997) was created and mandated to investigate the development and use of the information highway for the economic, cultural and social advantage of all Canadians. The 1995 IHAC report provided 300 recommendations, and also identified 15 public policy issues. One recommendation called for the creation of an advisory council to identify new information technology applications for the health sector. As a result, the National Forum on Health (NFOH; 1994-1997) was launched. The Forum's 1997 report concluded that a prime objective should be the rapid development of an evidence-based health system, and that a nationwide population health information system should be created.

In 1997, the Advisory Council on Health Infostructure (ACHI, 1997-1999) was established. Its final 1999 report reaffirmed the need and advantages of setting up a nationwide health information highway, particularly with regard to improving quality, accessibility, and efficiency of health services across the entire spectrum of care in Canada. That same summer, Health Canada also established the Office of Health and the Information Highway (OHIH) as Health Canada's focal point for the use of ICTs in the health sector. The strategic orientations for OHIH were identified as knowledge development, partnerships and collaboration, and federal policy development.

Also in 1997, the Canadian Network for the Advancement of Research, Industry and Education (CANARIE, now CANARIE Inc.) issued a vision paper describing a Canadian health "Iway". In 1999 the Advisory Committee on Health Infostructure (ACHI; 1999-to date) was inaugurated by the Federal / Provincial / Territorial Deputy Ministers of Health. The ACHI has working groups that address five priorities: strategic planning, telehealth, protection of personal health information, health surveillance, and electronic health records. A recent ACHI report (2001) contains recommendations and action steps intended to allow health jurisdictions to move forward significantly, and in a collaborative manner, towards the establishment of a pan-Canadian health infostructure. Notably, this report also acknowledged that "the policies to enable telehealth are still not fully in place especially for provider reimbursement, clinical accountability and professional licensure. Regardless, telehealth implementations are increasing across the country, with a significant increase in activity during the past 24 months".

Last year (2001) the Government of Canada committed to an investment of $500 million to create and fund an independent corporation mandated to accelerate the development and adoption of modern systems of information technology, such as electronic patient records, so as to provide better health care. The culmination of this funding initiative was the founding of the Canada Health Infoway Inc. (Infoway) this year (2002).

Throughout telehealth's development in Canada, the need for appropriate policy has been acknowledged, and responsibility for its development has been given to various groups. OHIH has responsibility for several policy development activities, and is directly responsible for the development of federal telehealth policy. Their key policy areas are: Integrated Provider Solutions, Protection of personal health information, Telehealth issues of licensure and reimbursement, and Change management.

3. Global Telehealth Policy

The cross-jurisdictional nature of telehealth makes it imperative to develop domestic policy with an eye to international policy, and vice versa. For this reason, it is important to place Alberta's and Canada's telehealth policy position in perspective. All developed nations are facing similar healthcare issues and are equally concerned about their fledgling telehealth systems. For example, a recent report identified at least eight other countries that have national health information and technology strategies either in place or being developed: UK, New Zealand, USA, Italy, France, Japan, and Germany. In other work, 20 countries were identified as having some defined telehealth policy or clear policy activity. Examples are:

Legislation. The US has legislation in regard to reimbursement policy, but in almost two years of implementation has reimbursed a total of only $20,000 for 301 teleconsultation claims. Inter-State licensing issues are increasing in significance, and some compacts have been developed in an attempt to address this. In the world of global telehealth, Malaysia stands out. It has a 20-year ICT plan termed the Multi-Media Corridor initiative, and is the only country to have clear legislation, with both a Telemedicine Act, and specific National Telehealth Policies.

Policy Guidelines. A few countries possess policy statements that guide their telehealth infrastructure development. For example, like Canada, Australia views telehealth as a priority, and has developed strategy documents to develop it further. They have also investigated telehealth policy in other countries. Within the European Union (EU) many telehealth activities flourish, funded by both national governments and the EU, but policy development lags. Nordic countries have developed guidelines, and the UK has some nascent guidelines. National telehealth policy in some countries is absent because telehealth is considered a responsibility delegated to regional authorities (e.g. Italy), which raises concern for consistent and complementary policy within some countries.

In summary, the vast majority of the world's 234 populated countries have no telehealth policy. Since policy is meant to guide, this telehealth policy void is a concern that must be addressed in an urgent manner.

IV THE STATE OF THE SCIENCE REVIEW – AREAS OF BENEFIT

This section briefly describes the evidence and policy implications from Volume One of the research study.

1. Areas of Benefit

Table 1 provides a summary of where the evidence of benefit exists for telehealth applications. The primary socio-economic indicators referenced in the literature are listed across the top row of the table. Subject areas are listed on the left side of Table 1, and the data in each cell represents the number of studies with Good to Fair scientific evidence (based on the 1995 Jovell/Navarro-Rubio rating scale (Hailey et al, 2002)) of the benefit of telehealth as compared to traditional health care delivery methods.

A brief explanation of each of the areas of benefit follows:

1) Access can refer to
   - improved access to health services (assessment, treatment or follow-up) for patients attributable to reduced time or travel costs, increased convenience; or
   - improved access to peer/professional support for health care providers.
2) Cost savings, cost-effectiveness, and reduced health services utilization are all economic benefits of telehealth which can accrue to patients, providers and/or the health system.
3) Educational benefits of telehealth have been proven for patients and families, and health providers.
4) Support can refer to emotional, spiritual and/or informational communication to patients or caregivers by professionals or peers. The quality of life benefits of support may include improved self-efficacy or coping skills, and the ability for individuals to maintain independent living arrangements.
5) Social isolation with respect to patients and families is recognized as one of the key social determinants of health. Professional isolation in a remote community can also be a socio-economic indicator putting community at risk (i.e., of losing skilled professionals and health services).
6) Acceptability / client satisfaction reflect the perceptions of telehealth users, which can include patients, families and/or providers
7) Several studies have demonstrated improved clinical or functional health outcomes via telehealth as compared with traditional health care delivery methods.
8) Quality of care can be improved through telehealth via enhanced treatment and follow-up.
9) Quality of life can involve self-efficacy and self-care, improved access to information ability to return to work or to perform activities of daily living, reduced life stress. Improved social/emotional support, and reduced social isolation can also be classified as quality of life benefits; however, they are listed separately here because of the volume of studies dealing specifically with those issues.

Table 1 Areas of Benefit of Telehealth Applications

Areas of Benefit:		1	2	3	4	5	6	7	8	9
Subject Area	*Number of studies providing Good to Fair evidence**	*Access*	*Cost / CE / Decreased health services utilization*	*Education*	*Support*	*Social Isolation*	*Acceptability / Satisfaction*	*Health Outcomes*	*Quality of Care*	*Quality of Life*
Geriatrics	16	8	6	3	4		6	3	2	
Paediatrics	24	3	9	1	3	1	2		3	3
First Nations	2			1						1
Telerehabilitation	5		2	1			2		1	3
Tele-Mental Health	16	2	2	3	3	1	2		3	1
Teleradiology	30	10	15					1	3	
Rural / Remote	7		1	1			4		1	1
Tele-Homecare	9	1	6				4		2	2
Renal	0									
Systematic Reviews	17	3	4				4	4	2	

* Note: this denotes the number of studies within each subject area which demonstrated Good to Fair scientific evidence based on the 1995 Jovell/Navarro-Rubio rating scale (Hailey et al, 2002). A number of other studies that did not meet the Good to Fair criteria were also analyzed within each subject area, for content related to socio-economic implications of telehealth, but these studies are not included in this table.

The evidence of socio-economic benefit in each subject area is provided in greater detail in Volume One: State of the Science Review.

2. Telehealth Benefits to Stakeholders

Table 2 provides a summary of the various benefits to health system stakeholders that have been suggested in the literature.

Table 2 Summary of the socio-economic impact of telehealth on stakeholder groups

Patients and Families	**Providers**
• Increased access to services • Personal cost savings, i.e., time and travel expense through substitution of telehealth for face-to-face treatment • Improved or equivalent clinical and/or functional health outcomes and quality of care (as compared with traditional care) • Increased empowerment, patient involvement and participation in care, positive perception, satisfaction • Enhanced self-care skills and potential for patients to live independently in their own homes, particularly for elderly and disabled persons • Quality of life benefits, including reduced life stress, improved access to information, social and emotional support, and reduced social isolation • Education	• Improved efficiency in work – If it is the provider that travels to provide care to remote patients (e.g., satellite clinics), then telehealth can result in travel time savings and providers are able to see more patients. – If it is the patient that travels to a central site to receive services, then telehealth, which may represent increased convenience for patients, can have a positive impact on no-show rates. • Improved access to professional/specialty support, particularly for rural/remote providers, and associated with this: reduced social isolation and enhanced skills • Increased access to educational opportunities and skills development
Programs	**Regional Health Authorities / health organizations**
• Improved cost-effectiveness of health programs delivered to specific populations. • Reduced costs of direct care, medication costs, etc.	• Cost-effectiveness, through, for example – reduced utilization of health services (i.e., reduced hospitalization rates, reduced utilization of outpatient services, emergency services) – reduced costs of patient transport from remote locations – reduced costs of service delivery • Alignment with strategic policy; for example: in accordance with patients' preferences, enhancing their ability to live independently and stay in their homes as long as possible
The Public	**At the provincial and national levels**
• Retention of health services professionals; sustainability of health services in smaller, rural/remote communities; economic viability • Increased choice / more options in health care • Enhanced prevention and health promotion initiatives which can be offered via telehealth feasibly and cost-effectively	• Positive impact on health human resources recruitment and retention • Alignment with current policy and strategic initiatives, including – support for primary care – new, innovative ways of delivering health services – prevention / health promotion – complementary to electronic health record (EHR) development and implementation

The State of the Science Review has led to the development of a number of recommendations specific to the subject areas identified in this study. In addition, there was valuable information from policy-related studies with respect to telehealth benefits, implementation and sustainability in general, and in relation to some applications in particular. The following sections V and VI describe the policy review and development process and the results found in the policy literature.

V POLICY REVIEW PROCESS

1. Awareness and Engagement process

A local Policy team was assembled to develop and inform the policy section of the study. Members of this Policy team are listed in Appendix A.

Wider awareness and engagement were identified as critical aspects of the policy component of this study. An environmental scan, including discussions with the local team, was performed to determine existing frameworks for policy engagement. No established frameworks were identified. The local policy team thus developed its own strategy for engaging policy and decision makers, with assistance and feedback from Dr. Jacques Magnan and Dr. Doug Wilson, Alberta Heritage Foundation for Medical Research (AHFMR). The first five of the six steps of the policy strategy have been completed:

1. A list of awareness and engagement opportunities for key policy and decision makers was developed:
    - Participate with our team in the development of an optimal engagement policy
    - Obtain further information about the study, either in person or in writing
    - Visit our web site to receive ongoing bi-monthly progress reports
    - Receive executive summary of final report
    - Attend the Summer Telehealth Research Institute, which had a session dedicated to this topic
    - Engage in audio/video teleconferencing sessions around specific issues related to the study
    - Request open houses, road shows, presentations
    - Advise on appropriate press releases

2. Members of the local policy team identified key provincial/territorial and federal policy and decision makers.

3. These identified persons were sent a letter which described the study, suggested the opportunities listed above, and asked for their input, expertise, and participation in framing recommendations. These individuals in turn identified additional contacts, who were approached in the same way. The complete list of Policy Working Group Contacts is given in Appendix C.

4. All Policy Working Group Contacts were provided a study update in early October, 2002. A number of individuals provided feedback on the project.

5. Selected contacts with expertise in specific subject areas of the study were approached for guidance in framing recommendations.
    - Sharlene Stayberg, Telehealth Director, Alberta Wellnet, and the Provicial Telehealth Geriatric group, regarding the Geriatric Telehealth chapter
    - Dr. Al Cook, Dean, Faculty of Rehabilitation, University of Alberta, regarding the Telerehabilitation chapter
    - Ernie Dal Grande, Telehealth Program Manager, First Nations and Inuit Health Branch, Health Canada, regarding the First Nations chapter

6. Other components of the policy awareness and engagement strategy include:
   - Design a one-page summary of the project for circulation at upcoming conferences and workshops. Two abstracts and two presentations have been prepared and disseminated; one for the Canadian Society for Telehealth conference, Vancouver, British Columbia, October, 2002; the second for the National Telehealth Research Summer Institute, Calgary, Alberta, Summer, 2002.
   - Invite feedback from policy and decision makers on the State of the Science Review and the final Policy Report. (Will be initiated at the end of October, 2002.)
   - Circulate the State of the Science Review and Policy Report through the SEARCH network (http://search.cche.net) and the Alberta Wellnet Provincial Telehealth Committee (web site). (Will be initiated at the end of October, 2002.)
   - Share the tele-homecare package with Canadian and German colleagues, as part of a Germany-Canada Telehealth commitment.

2. Critique of Policy Sources

Policy sources were originally identified in the literature search which has been described in the State of the Science Review. The literature search grouped abstracts into 10 subject areas (see p. 15).

As investigators reviewed articles and sources in these subject areas, they referred policy- and economic-related sources through the central office to the investigators responsible for the policy and economic analyses.

The following information was abstracted from all policy sources included in this report (as per the Cochrane Collaboration Review Manager software; website: http://www.cochrane-net.org/revman/):

- Article / Title / Author / Year / Country / Location
- Study Design
- Modality
- Participants: age / gender/ groups
- Intervention / Exposure
- Outcomes / Socio-Economic Indicators
- Strength of study
- Policy Recommendations
- Applicability to Alberta

Analysis of policy sources can be found in Appendix P: Critique Policy

The strength of the policy studies (level of evidence) was judged as low, moderate, or high based on the expert opinion of the reviewer, using predetermined criteria including:

- knowledge of telehealth and the Alberta context;
- logical and comprehensive flow of information in the paper; e.g., did conclusions relate directly to objectives?
- quality of the study and source.

Readers can refer to the Appendix R: Bibliography for complete list of articles and sources referenced in the State of the Science Review and this Policy Report.

3. Strengths and Limitations of this Study

The primary strength of the study was the varied and extensive expertise and experience of the project team, which consisted of the principle investigator and five other investigators, a research librarian, a local policy team of eight telehealth, information and communications technology (ICT), public health, and epidemiology researchers, policy leaders and strategists; as well as project managers and assistants. The list of project team members, their titles and qualifications, can be found in Appendix A: Project Team Members, Advisors and Assistants.

Midway through the project (Summer, 2002), a Policy Working Group, consisting of federal/provincial/territorial policy- and decision-makers, was identified through key contact referrals. This group was made aware of the study, its purpose and objectives, and many of these individuals provided valuable contributions in terms of policy implications and interpretation, and development of the results framework.

A comprehensive and exhaustive literature search enabled the team to identify a consummate body of literature related to the two key subjects of the study: 1) e-health / telehealth and 2) Social Determinants of Health / socio-economic indicators. Clearly outlined research questions and review processes enabled the effective progression of the study.

There are three limitations to this study which should be mentioned. Firstly, State of the Science Program limitations precluded the ability to have two reviewers assess each paper in this study. Once abstracts were grouped by subject area (i.e., Paediatrics, telerehabilitation, etc.), the subject areas were divided amongst five investigators and the task of selecting and reviewing articles relied upon the individual expertise and experience of one of five investigators. To mitigate any potential differences in selection and review processes, criteria were developed and the team met regularly to review progress and to discuss and resolve particular issues or concerns.

Secondly, systematic reviews could not be assessed for strength of evidence as no rating system was available. The search strategy for telehealth review sources identified both systematic reviews and literature reviews, which are differentiated within the reviews analysis. A paper can be called a systematic review if it satisfies certain criteria, such as clear research question and associated transparent search strategy, and inclusion/exclusion criteria.

Thirdly, the subject areas identified for this study represent promising areas for telehealth application based on current health needs, initiatives, and recognized health system priorities. Consequently, evidence pertaining to each subject area and the ensuing recommendations cannot be generalized across subject areas or to the population as a whole. For instance, evidence and recommendations related to a medical condition in Geriatrics cannot be applied to the same medical condition in adults. Wherever evidence or recommendations have been provided which relate to a particular population group, this has been specified.

VI RESULTS OF THE POLICY REVIEW

The review of policy studies, as well as policy implications from the State of the Science Review, led to the development of six main strategies for successful and sustainable implementation of telehealth. These are:

1. Integration,
2. Policy goal-setting,
3. Recognition and resolution of policy barriers / challenges in telehealth,
4. Collaboration, partnerships and sharing,
5. Identification of high-impact areas for telehealth, and
6. Evaluation and research.

1. Integration

Telehealth projects are often conceived, implemented and evaluated as stand-alone initiatives. Health providers' and patients' experiences with pilot projects have further entrenched this view. It is necessary that policy and decision makers within the health system, as well as administrators, providers, patients and the public come to see telehealth as part of the bigger picture of health services delivery. Mitchell (2000) states that telehealth is more likely to be cost-effective and sustained if it is seen as part of the larger domain, that is, e-health – the use of telecommunications technologies (video-conference, telephone and Internet) with information technology (computer databases, image capture, electronic ordering, storage & retrieval systems).

Enhanced health and cost benefits can be achieved by leveraging telehealth programs with other emerging telecommunications / information technology innovations.

Examples of integrated telecommunications and information technology are:

- a nurse-managed telephone-based health monitoring and patient education program aided by a computerized decision-support system;
- an in-person local provider-patient clinical consultation, where a distant specialist attends or can be summoned if needed via video-conference; with biomedical telemetry to transmit clinical data;
- a support network for caregivers involving an informational computer program and e-mail communication with peers and/or professionals.

A key principle for integration is to make telehealth part of an organization's strategic plan, rather than just being introduced in a series of demonstration projects.

In addition, a communication plan, working to increase awareness of telehealth among health care providers, educators and consumers to better integrate telehealth into the health care system, will help in changing the perspective of it being an 'add-on' service, and in informing potential consumers of more choices in health care. A communication plan should include national and provincial policy statements, as well as research and evaluation findings on telehealth.

2. Policy Goal-setting

Ricketts (2000) found that in the hospital setting, market-driven changes are more dominant than policy-directed reform (in terms of implementing new technologies). One implication of this observation is that cost-effectiveness should be a key criterion in selecting telehealth applications. However, it need not be the primary nor even a major criterion in all cases. Menolascino (1989) emphasizes that establishing a guiding philosophy in planning a telemedicine program is key to success. Improving cost-effectiveness in health services delivery may be one example of this, but so may improving access to health care for remote/underserved populations. It is possible for the two principles of cost-effectiveness and access to be consistent, but improving access can also be seen as possibly increasing costs from a health system point of view – even if it reduces costs from a societal point of view (i.e., including private costs faced by patients as well as program costs). Such an example illustrates the need for a clear guiding principle that considers all of the potential impacts of a particular telehealth program. It also demonstrates the need to be clear about the perspective being adopted (i.e., patient, provider, health system, society).

3. Recognition and Resolution of Policy Barriers / Challenges in Telehealth

There are a number of issues that are frequently mentioned in policy papers and in scientific studies that are limiting the success of programs and constraining the widespread adoption of telehealth. Some of the most problematic are:

- Professional issues of credentialing, reimbursement, licensing, and registration;
- Legal issues of privacy and security;
- Ethical issues of confidentiality, consent, and authorization (data access);
- Reimbursement and other operational (funding);
- Accreditation;
- Commercial issues of intellectual property and copyright;
- Interoperability (technical, professional, organizational);
- Communication issues such as cross-border acceptance, use of common 'language'.

Policy and decision makers, and telehealth project leaders, are working to address these issues but comprehensive solutions have not been established. Professional associations need to continue to be involved in setting standards for the technology used in telehealth applications in specific areas (e.g.: teledermatology, telepsychiatry), and in resolving the issues of professional competence, credentialing and licensing in the provision of telehealth services. Health regulatory bodies also need to be involved in policy decision-making in order to expedite regulatory changes to move telehealth forward.

Ashcroft and Goddard (2000) address some of these challenges in their article "Ethical issues in teleradiology". They recommend clear contracts between the user and provider of teleradiology advice, specifying:

- minimum standards of training;
- medical qualifications;
- liability, insurance and negligence;
- Total Quality Management (TQM) standards;
- clear and binding financial arrangements;

- standards of data protection and patient confidentiality;
- regular technology assessment, including economic evaluation.

This article is a concise resource for use when implementing a teleradiology program, or when developing research projects and/or policy.

Another challenge that needs to be addressed in implementing telehealth is the human factor. Development of strong, trusting inter-professional relationships and provider-patient relationships may require more time and effort, or different techniques, or may even be more essential in a telehealth setting, as opposed to traditional health care delivery settings. Without strong interpersonal relationships, telehealth programs may break down. In order to develop strong relationships, the following strategies may be useful:

- Understand provider and patient expectations;
- Communicate (and, ideally, achieve a common understanding of) the goals and objectives, rationale, benefits and limitations of the telehealth program to all users (patients, providers, technicians);
- Provide training and education.

Telehealth has an impact on human resources. Health and medical workforce implications associated with the advancement of information technology and telecommunications in health care include: overall numbers, mix of health care providers (HCPs), geographical distribution of HCPs, changing professional boundaries and changing skill requirements of HCPs (Swanson 1999). It is important that provincial and national policy and decision makers be forward-thinking in health human resources planning.

Another human factor in the success of telehealth is "readiness" of both communities and health organizations. Community readiness refers to the level of experience and acceptance that that public has with respect to technology. Campbell et al (2001) describe three levels of community readiness and suggest approaches to the introduction and implementation of telehealth in each case. In assessing readiness, it is important to understand perceptions of patients, as well as providers. From the provider viewpoint, telehealth has the potential to open up new markets for urban specialists. On the other hand, a US study reports that rural physicians facing competition from their urban counterparts may view telehealth as a threat to their livelihoods and resist implementation or use of telehealth programs in their community (Sinha, 2000).

Organizational readiness is related to the health delivery processes, procedures, and standards that are in place and how a telehealth program fits with these. It may be necessary to orient staff to new ways of doing things in order to effectively accommodate telehealth. Wheeler (1998) proposes that a critical success factor for telehealth will be redesigning the way care is delivered while maintaining or improving the quality of care.

Overcoming many of the barriers to telehealth that have been discussed here involves openness to change on the part of individuals, health care providers, health organizations / Health Regions, and provincial and federal governments.

A final point related to ethical considerations, introduced by Preston et al (1992), is the notion of an organization being held liable for NOT offering telehealth. This is a 'new twist' that Alberta may want to consider in terms of the legal implications of developing new programs and in policy planning.

4. Collaboration, Partnerships and Sharing

There are significant opportunities for improvements in efficiency and patient care through inter-jurisdictional sharing of skills and services via telehealth. Canadian health care decision makers need to examine existing stove pipes and take every opportunity to share resources across regions and to integrate existing systems and institutions

There can be advantages to collaboration between industry and health care organizations. These may include opportunities to trial technologies in a particular setting (e.g., if there are doubts as to the generalizability of the proven benefits of a given telehealth application to the local setting, or its interoperability), and the ability to communicate local needs and required adaptations to a technology provider.

There needs to be broader inclusion of the public in decision-making regarding telehealth options. There is evidence that the public is willing to trade-off some aspects of traditional health care (e.g., in-person specialty follow-up consultations) for the advantages of telehealth (faster access to care, less personal travel expense).

5. Identification of High-Impact Areas for Telehealth

Needs assessment

Evidence from the State of the Science review indicated that telephone-based applications can be cost-effective and can improve access, outcomes, and satisfaction with care in certain populations. While video-based application tends to be the better known telehealth concept in Alberta, education and administration are currently the two greatest uses of these systems, with minimal growth in clinical services. This may be explained by some of the barriers identified previously, such as:

- unresolved medical-legal issues associated with video-based clinical consultation,
- inadequate/incomplete reimbursement for clinical consults via video,
- the need for better integration of the video-based clinical consultation with the electronic health record and data transfer in general.

However, the question remains as to whether education and administration are the areas of greatest need for telehealth services and if these are the areas where the greatest impact on health and social outcomes will be realized.

Improved access for remote and underserved populations is often recognized as a priority in telehealth. Goldsmith and Ricketts (1999) devised a method of combining the designations of 'Medically Underserved Population' and 'Health Professional Shortage Area' based on the following variables:

- Population count;
- PCP count;
- Percent of population with income <200% of poverty level;
- Percent of racial minorities;
- Infant mortality rate and low birth weight;
- Percent of population linguistically isolated;
- Population density;

- Other variables.

This framework may be useful in assessing/determining need for specialized telehealth programs.

Risk Assessment

Risk assessment is an important component of program planning. While some program limitations can be anticipated and accommodated, there can be unexpected socio-economic impacts of telehealth on a community. Program evaluation must be open enough to capture these so that they can be investigated and understood.

An example is the issue of independence versus social isolation. Technology may lead to increased independence for patients, specifically in the home, but it also has the potential to lead to increased social isolation if the need to go outside of the home to seek services or support is obviated, or if carers are replaced with technology. This issue is particularly important in the context of tele-homecare. The implementation of programs must consider the needs and choices of individual patients in the wider social context.

Considering risk in a broader perspective, decision makers need to be cognizant of the policies being developed / recommended and of the ways in which these polices are expected to drive change in our health care system, versus actual effects. For instance, Taylor (1999) in the article: "Do Targeted Efforts for the Rural Underserved Help Kill Comprehensive Reform?" suggests that telehealth solutions in rural areas may suspend needed, larger scale response to the problems of equity in health care access. Associated with this concern is the following US-reported notion: that an unintended (possibly undesirable) long-term effect of telehealth may be to further concentrate health specialists and resources into urban centres, resulting in reduced direct access to health services for small/remote communities and increased isolation (Sinha 2000).

A concern presented by Swanson (1999) is that "the likely social effects of the advancement of information technology and telecommunications in the health care field in Australia are 'location independence' of a range of activities and widening gaps between the 'information rich' and 'information poor'". The suggestion is that most of the underserved groups will fit into the 'information poor' category.

6. Evaluation and Research

The telehealth literature tends to focus mainly on health system costs and personal time and travel considerations, as opposed to a broader range of socio-economic indicators. Of particular interest to this study, but also absent in the literature reviewed, is the direct measurement of the impact of telehealth on the social determinants of health, i.e., poverty, social isolation, education, life stress, early life, access to transport, and nutrition. New research should employ appropriate methodologies for studying and answering these questions. In addition, new frameworks for economic analysis need to be developed which can capture non-monetary and unintended consequences, as well as monetary measures.

The principal driving forces for telehealth have been financial, specialist clinical interest, and proof of technological feasibility. Patients' views and interests, societal effects, quality controls and wider organizational effects are seldom considered (Roberts, 1998). There are, however, studies that note the importance of conducting telehealth research that is focused on aspects beyond financial considerations, suggesting the importance of considering patients' views and interests. Despite the rapid design, innovation and sleek, user-friendly devices, the redefining of health care delivery should still contain a significant application of compassion and caring (Albright and Slater, 2000). Additionally, Fisk (1998) states the need to maximize the acceptability and usability of telecare to meet the social objective of independent living. Also to be considered are the needs of special populations (including Aboriginals) (Lessing and Blignault, 2001), and those who do not have equal access to health care (Jukic and Bifulco, 1999).

Hayes (1998) suggests that there is a need for further research to explore the factors that contribute to organizational readiness for successful implementation of telemedicine. Campbell et al (2001) may be a useful resource in assessing readiness.

Because it takes time to observe a measurable change in socio-economic indicators and particularly in the social determinants of health, research on the impact of telehealth on these factors requires a longer time span in order to produce sound and quality evidence.

Research Questions

Preston et al (1992) is a useful resource regarding research design and development of researchable questions. Capalbo (1999) suggests that a key method of assessing the value and effect of telehealth is by observing how it affects the behaviour of consumers in terms of where and how they seek care. For example, what are the short-term versus long-term patterns of care-seeking; how do care patterns change when a service is altered / added / removed?

Evaluation Frameworks

Capalbo (1999) recommends 'benefit-cost analysis' (BCA) as a framework for analysis for telehealth, with consideration of the disparate distribution of costs and benefits on different parties, e.g., patients, physicians, other health care providers and tax-payers. Similarly, Baer (1997) suggests a framework for evaluation in a 3x3 matrix formed by accessibility, cost, and quality against client, provider, and society. Angaran (1999) is a good resource document for the development of an effects-oriented framework and risk analysis framework for evaluating telehealth.

It is important for professionals in this field to share information about their experience and to examine the results of evaluations to speed up suitable development work (Riva and Gamberine, 2000).

The following dilemma has been identified: on the one hand, decision makers need to use caution in implementing telehealth programs based on the quality of the existing evidence. On the other hand, evidence from some studies, despite the quality of the study design, can provide guidance on selected programs that appear to be appropriate applications. For instance, certain telehealth applications, which may or may not have proven cost-effectiveness, can benefit remote or underserved communities by increasing access to service.

VII RECOMMENDATIONS

General recommendations arising from this study are:

A. Policy

1. To be successful and sustainable, telehealth must be fully integrated into existing health structures and processes in a practical and policy manner.
2. Integration can be achieved through aligning telehealth initiatives with existing strategic health plans, policy goal-setting, accompanying action steps, and attention to policy barriers.
3. Establishment of a policy forum that focuses on telehealth policy would facilitate these needs.
4. Telehealth applications should incorporate capacity for education, research, and administrative functions, as well as health and clinical functions.

B. Technology

5. To facilitate access to many bandwidth intensive telehealth applications increased broadband connectivity is needed, particularly to rural and remote communities.
6. Given the evidence, the use of telephone-based telehealth applications should be re-examined.
7. Technology modalities (broadband, narrowband, web-based) and applications (videoconferencing, data monitoring, telephone) should be viewed as synergistic, not competitive, and the most appropriate tool applied; i.e., hybrid connectivity solutions are recommended.

C. Evaluation

8. Suitable outcome indicators, measures, and reliable and valid instruments for socio-economic benefit of telehealth must be identified, defined, and consistently applied within a recognized evaluation framework that asks relevant research questions.
9. Suitable frameworks for economic analysis need to be developed that capture non-monetary and unintended consequences, as well as monetary measures.
10. Telehealth programs should be implemented and evaluated in a culturally aware and culturally sensitive manner.
11. Evaluations should include examination of the social, organizational, and policy aspects of telehealth.

D. Economic

12. Telehealth demonstrates sufficient evidence of socio-economic benefit to indicate ongoing investment is appropriate.

13. Sustainable telehealth 'programs' and not 'projects' should be targeted.

14. Full integration of telehealth will increase its use and decrease the per contact episode cost.

15. Investment in information and communications technology infostructure should be considered as an investment not only in health, but in business, education, and other e-sectors.

E. Investment Opportunities

16. R & D and economic development opportunities require pursuit.

Subject-specific recommendations arising from this study are as follows:

Paediatric Telehealth

17. Telehealth programs that improve quality of care and offer economic benefit for 'at risk' paediatric populations (e.g., neonates, adolescent asthmatics) should be introduced.

18. Evidence would suggest decision makers should consider telehealth to achieve enhanced social environments for children, and staff efficiencies as related to data transfer.

19. The use of low-cost technology solutions (e.g., the telephone) is strongly recommended for Paediatric telehealth where appropriate.

Geriatric Telehealth

20. Telehealth programs should be used to support palliative home care initiatives.

21. Remote, wireless monitoring (e.g., personal alerts, caregiver and patient support, 'smart' homes and clothing) should be investigated for both enhanced independent living and geriatric healthcare applications.

22. Geriatric telehealth applications should be strongly considered as a technology R & D and economic development opportunity.

23. The use of e-prescription applications should be used to increase self-efficacy and compliance, and to reduce adverse effects.

24. The use of low-cost technology solutions (e.g., the telephone) is strongly recommended for Geriatric telehealth where appropriate.

First Nations Telehealth

25. The recommendations provided in the Health Transition Fund project report of 2001 should be implemented, viz:
    - Increase connectivity to rural and remote communities, and especially Aboriginal communities;
    - Undertake new research further to implementation of successful telehealth initiatives in First Nations and Inuit communities, and regarding the impact of telehealth on costs, health services and human resources;
    - Promote equality of opportunity for telehealth across First Nations and Inuit communities;
    - Increase awareness and understanding of telehealth opportunities among First Nations and Inuit stakeholders;
    - Create linkages between telehealth and other initiatives of the Aboriginal Health Infostructure in order to leverage investments.

26. Health services and information content should be delivered in a culturally sensitive context.

Tele-homecare

27. Telehealth should be considered for application in managing and monitoring chronic heart failure, chronic obstructive pulmonary disease, oncology, diabetes, wound care, asthma, anxiety, and cardiac vascular accident.

28. Home Telehealth programs should be used to assist with and transform the mode of delivery of home care. Such programs should be used to support change within the context of the continuum of care, and a comprehensive home healthcare program.

Tele-mental health

29. Tele-mental health, a proven and sustainable telehealth application, should be expanded.

30. The use of low-cost technology solutions (e.g., the telephone) is strongly recommended for tele-mental health where appropriate.

Teleradiology

31. Teleradiology, a proven and sustainable telehealth application in settings of appropriate workload and distance, should be expanded.

32. Teleradiology should be adopted in settings where the need to travel or poor speed of care provision present barriers to access.

Renal Dialysis Telehealth

33. Teledialysis should be evaluated more comprehensively before commitment is made.

Rural and Remote Telehealth

34. Increased access to a broad range of clinical and educational resources should be provided to rural, remote, and underserved populations.

35. Enhanced connectivity to rural and remote communities and residences should be a priority to improve economies of scale in future service and information delivery.

Telerehabilitation

36. Telerehabilitation, which has been demonstrated to show benefits for health care and patients (e.g., speech pathology, transtelephonic exercise monitoring) requires more comprehensive economic analysis.

VIII SUMMARY AND CONCLUSION

This policy report has looked into the literature for policy implications of telehealth related to socio-economic determinants of health and also for guidance on how best to integrate telehealth into the mainstream so that benefits can be realized and sustained in the long term. The literature has revealed a focus on certain socio-economic indicators, such as cost, access, and satisfaction. The significance of these analyses cannot be overlooked; however, other indicators that have not been addressed in the literature but where telehealth may have a strong impact on population health should also be considered, for instance, social isolation, life stress, and poverty. This indicates opportunity for research and policy analysis and development. In the broad social context, various stakeholders, including patients, providers, and health organizations, can benefit in unique but related ways from telehealth.

Telehealth must be seen by decision-makers and administrators, and by providers and patients, as more than an add-on service in order for it to become fully integrated into the health care system and for it to reach its full potential. There are various barriers and challenges to the advancement and integration of telehealth including confidentiality, reimbursement, legal and ethical considerations, but there are also important aspects of the "human factor" that need to be addressed, including patient needs and preferences, patient and provider perceptions, relationships, workforce implications, and community readiness. These are a challenge for all stakeholders.

Depending on the health program and goals, there are many different proven telehealth strategies that can respond. For instance, cost-effectiveness has been demonstrated particularly in the fields of teleradiology and tele-mental health. Improved access for underserved populations can be addressed by identified applications in rural / remote telehealth, geriatric telehealth and home telecare. Based on the evidence that exists, this report provides specific, program area recommendations regarding key directions for telehealth in Alberta and Canada. However, sound evaluation of new initiatives must be a component of any project, and avenues must be opened so that innovative solutions can be tested. Therefore, general recommendations pertaining to policy, technology, evaluation, and economic analysis are also provided in this study.

In conclusion, the awareness, but more particularly, the engagement process will continue following the completion of this project. Knowledge of the benefits of the socio-economic impact of telehealth will continue to be provided as we move forward in an eager attempt to engage policy and decision makers in discussion about the future of telehealth.

APPENDIX A

FINALIZED LIST OF TEAM MEMBERS, ADVISORS, AND ASSISTANTS

Team Members

Dr. Penny Jennett – Principal Investigator

Head, Health Telematics Unit; Professor Faculty of Medicine, University of Calgary

Expertise contributed: Extensive experience as a telehealth and health researcher, including leadership positions in data and literature synthesis in telehealth, telelearning and medical/health education.

Role: Will direct the project, coordinate the efforts of the investigators and provide independent verification of article selection.

Dr. Richard Scott – Co-Investigator

Associate Professor, Health Telematics Unit, University of Calgary; Fullbright New Century Scholar

Expertise contributed: Diverse experience in review and synthesis of literature; telehealth researcher.

Dr. David Hailey – Co-Investigator

Director, David Hailey and Associates, Canberra, Australia; Professor, Department of Public Health Sciences, University of Alberta, Senior Advisor, Health Technology Assessment, Alberta Heritage Foundation for Medical Research

Expertise Contributed: Data synthesis and analysis gained over numerous projects, including three previous non-quantitative reviews in telehealth; specific cost-benefit experience.

Dr. Arto Ohinmaa – Co-Investigator

Associate Professor (Health Economics), Department of Public Health Sciences, University of Alberta

Expertise contributed: Expertise in the area of health economics; significant experience in performing systematic reviews in telehealth as well as years of front-line experience in telehealth research projects.

Dr. Roger Thomas – Co-Investigator

Family Physician; Professor, Faculty of Medicine, University of Calgary; Cochrane Collaboration Coordinator for the University of Calgary

Expertise contributed: Clinical experience; expertise in sociology, evidence based medicine and systematic reviews; particular expertise in the Cochrane review process.

Carol Anderson – Co-Investigator

Telehealth Consultant, CA Consulting

Expertise contributed: clinical experience; telehealth consultant

Dr. Barbara Young – Co-Investigator

Clinical Fellow in Internal Medicine; Chief Resident General Internal Medicine, McGill University

Expertise contributed: experience in clinical medicine and medical education; interest in rural clinical medicine.

Diane Lorenzetti

Research Librarian, Institute of Health Economics/Centre for Health Policy Studies, University of Calgary

Expertise contributed: advisor on search strategy and Reference Manager software

Louise Affleck Hall

Project Manager, Health Telematics Unit, University of Calgary

Lorna Milkovich

Project Coordinator, Health Telematics Unit, University of Calgary

Caroline Claussen

Research Assistant, Health Telematics Unit, University of Calgary

Tara Perverseff
Research Assistant, Health Telematics Unit, University of Calgary

Susan Brownell
Project Assistant, Health Telematics Unit, University of Calgary

Ali Jadavji
Summer Student, Health Telematics Unit, University of Calgary

Julianne Sanguins
Summer Student, Health Telematics Unit, University of Calgary

Stephanie Yeo
Summer Student, Health Telematics Unit, University of Calgary

Local Policy Team Advisors

Advisors will contribute specific areas of expertise towards implementing a rational review design and drawing relevant conclusions from the results. All advisors will contribute up to five hours per month, with the exception of Ms. Lorenzetti, who will contribute approximately 100 hours over the course of the review process.

Dr. Tom Noseworthy

Intensive Care Physician; Information Communications Technology (ICT) and Policy Researcher, Department of Community Health Sciences, University of Calgary

Expertise contributed: expertise in health care policy and management based on practical and academic experience on multiple administrative levels; special expertise in telehealth

Dr. Steve Edworthy

Rheumatologist; Telehealth Researcher, Health Telematics Unit, University of Calgary

Expertise contributed: clinical experience; special expertise in ICT solutions as applied to the management of chronic diseases and physician offices.

Dr. David Topps

Family Physician; Chair, WONCA Rural Information Technology Exchange; Chair, Rural Practice Committee, College of Family Physicians

Expertise contributed: clinical experience; expertise in systematic reviews and the challenges of rural medicine, specifically as these relate to ICT use in practice.

Janice Hopkins

Director, Knowledge and Policy Development Office, Office of Health and the Information Highway, Health Canada

Expertise contributed: expertise in national policy as it applies to ICT implementation in the public sector

Dr. Penny Hawe

Professor, Markin Chair in Health, Wellness and Society, University of Calgary

Expertise contributed: expertise in policy, public health, epidemiology, psychology and evaluation of health promotion programs

Mr. Steven Lewis

Adjunct Professor of Health Policy, University of Calgary; Health Policy Consultant, University of Saskatoon.

Expertise contributed: many years experience in national and provincial health policy research and research synthesis

Dr. Robert Hayward

Physician (Internist); ICT Researcher, Department of Public Health Sciences, University of Alberta

Expertise contributed: clinical and ICT researcher within the health sector

APPENDIX R

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FINAL REPORT

Socio-Economic Impact of Telehealth: Evidence Now for Health Care in the Future

Volume Two: Policy Report

A report prepared by the
Health Telematics Unit,
University of Calgary

17 January 2003

Funded by the
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Final Report submitted to Alberta Heritage Foundation for Medical Research, January 17, 2003.

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I EXECUTIVE SUMMARY

Telehealth has become widespread in the last two decades, despite the fact that scientific evidence to support its use has often been lacking. This study was undertaken to contribute to the Alberta Heritage Foundation for Medical Research (AHFMR) 'State of the Science Reviews' program, and provides an information base to assist policy- and decision-makers, and researchers, in their deliberations about telehealth. It supercedes other telehealth meta-analyses due to its focus on the social, as well as the economic, impact of such technologies. Further, this study is unique in that it provides two documents that are closely linked – a State of the Science Report, and an accompanying Policy Report. This is the first such combined Report to date.

Telehealth, telemedicine, or e-health is defined as "the use of information and communication technology (ICT) to deliver health services, expertise and information over distance, geographic, time, social and cultural barriers." Telehealth encompasses Internet or web-based "e-health", as well as video-based applications. Applications can be real-time or store-and-forward.

This report summarizes the health services scientific and policy literature on telehealth. Based upon a comprehensive literature search and a critical review and appraisal of that literature, the report provides an overview of the strengths and weaknesses in the telehealth research base, identifies gaps in the existing knowledge, and reviews policy implications. Specifically, this study addresses the following questions:

1. What is the socio-economic impact of telehealth as a method of delivery of healthcare and information, compared to that of the status quo? For patients and their families? For providers, programs, institutions and regional health authorities? At the provincial and national levels? For the public in general?
2. What are optimal indicators and proxy indicators for the assessment of the impact of telehealth?
3. What are related recommendations for policy and decision makers?

The report consists of three volumes. Volume One describes the general areas of health benefit supported by proven telehealth applications from the literature. Volume Two summarizes the related policy implications and recommendations, and Volume Three provides appendices that summarize the literature and support Volumes One and Two.

1. Socio-economic impact of telehealth

Telehealth has been found to offer important quality of life, health, and socio-economic benefits to the people of Alberta and Canada and to reduce costs and utilization of the healthcare system.

Based upon existing literature, a total of 14 social determinants of health or socio-economic performance indicators for a community were identified for this study. Of these, the study identified nine areas of socio-economic benefit as most prominent in the telehealth literature: Access, Cost / Cost Effectiveness / Decreased Health Services Utilization, Education, Support, Social Isolation, Acceptability / Satisfaction, Health Outcomes, Quality of Care, and Quality of Life. Ten subject areas, representing the most promising areas of telehealth application, were identified for study: Geriatrics, Paediatrics, First Nations, Telerehabilitation, Tele-mental health, Teleradiology, Rural / Remote, Tele-homecare, Renal, and Systematic Reviews of telehealth. The literature demonstrates varying levels of scientific evidence of socio-economic benefit in various telehealth applications across these subject areas. The subject specific recommendations provided in this review reflect the areas where the greatest impact of telehealth can be achieved, based on this evidence.

2. Optimal indicators and proxy indicators

A variety of outcome measures have been documented in the literature (access, quality of life, satisfaction, cost), but no studies clearly identified or defined specific socio-economic indicators of outcome. At this time there is no agreement on which quantitative or qualitative measures (i.e. outcome indicators) are appropriate, or of most value, when evaluating telehealth applications. The indicators screened for in this review based upon accepted determinants of health, but these are not as yet reflected as formal indicators in the telehealth literature. This study found no consistency in the identification or application of such indicators within, or between, studies in any subject area. Cost, cost savings or cost effectiveness were of common interest to many studies, but measurement of these were not consistent, with many studies using estimates as opposed to solid economic analysis. Moreover, benefits and costs were evaluated from different points of view, for instance, the health system point of view versus the wider societal point of view. As a result there is uncertainty as to the general applicability of some study data, and direct comparison of one study with another may be misleading. This finding highlights a critical gap in our current research process and capabilities. Appropriately focused research questions and designs, validated instruments and defined quantitative or qualitative measures are required.

3. Recommendations for policy and decision makers

Based upon the evidence available, this study identified 40 general and subject-specific recommendations. Subsequent review found these to be congruent or complementary to Alberta and Federal health reform initiatives described in the recent Mazankowski, Kirby, and Romanow reports, each of which call for change and reform, not maintenance of the current structure. Telehealth is seen as an enabler of change and an innovative means of enhancing health care and health care delivery.

General recommendations arising from this study are:

A. Policy

1. To be successful and sustainable, telehealth must be fully integrated into existing health structures and processes in a practical and policy manner.
2. Integration can be achieved through aligning telehealth initiatives with existing strategic health plans, policy goal-setting, accompanying action steps, and resolution of policy barriers.
3. Establishment of a policy forum that focuses on telehealth policy would facilitate these needs.
4. Telehealth applications should incorporate capacity for education, research, and administrative functions, as well as health and clinical functions.
5. Federal-provincial/territorial partnerships in telehealth should be established where there are opportunities to improve efficiency in health care and decrease duplication.
6. As telehealth continues to evolve, input from all key stakeholders (including patients, health care providers, and the public) into policy development is required. Consideration of needs as well as practical experience is essential for a meaningful exchange of information and views.

7. Consistent terminology and definitions around telehealth, e-health and related terms should be adopted across jurisdictions.

B. Technology

8. To facilitate access to many bandwidth intensive telehealth applications increased broadband connectivity is needed, particularly to rural and remote communities.
9. Given the evidence, the use of telephone-based telehealth applications should be re-examined.
10. Technology modalities (broadband, narrowband, web-based) and applications (videoconferencing, data monitoring, telephone) should be viewed as synergistic, not competitive, and the most appropriate tool applied; i.e., hybrid connectivity solutions are recommended.

C. Evaluation

11. Suitable outcome indicators, measures, and reliable and valid instruments for socio-economic benefit of telehealth must be identified, defined, and consistently applied within a recognized evaluation framework that asks relevant research questions.
12. Suitable frameworks for economic analysis need to be developed that capture non-monetary and unintended consequences, as well as monetary measures.
13. Telehealth programs should be implemented and evaluated in a culturally aware and culturally sensitive manner.
14. Evaluations should include examination of the social, organizational, and policy aspects of telehealth.

D. Economic

15. Telehealth demonstrates sufficient evidence of socio-economic benefit to indicate ongoing investment is appropriate.
16. Sustainable telehealth 'programs' and not 'projects' should be targeted.
17. Full integration of telehealth will increase its use and decrease the per contact episode cost.
18. Investment in information and communications technology infostructure should be considered as an investment not only in health, but in business, education, and other e-sectors.

E. Investment Opportunities

19. R & D and economic development opportunities require pursuit.

Subject-specific recommendations arising from this study are as follows:

Paediatric Telehealth (SOS pp. 26-31)

20. Telehealth programs that improve quality of care and offer economic benefit for 'at risk' paediatric populations (e.g., neonates, adolescent asthmatics) should be introduced.
21. Telehealth programs that improve quality of care and offer economic benefit for 'at risk' paediatric populations (e.g., neonates, adolescent asthmatics) should be introduced.
22. Evidence would suggest decision makers should consider telehealth to achieve enhanced social environments for children, and staff efficiencies as related to data transfer.
23. The use of low-cost technology solutions (e.g., the telephone) is strongly recommended for Paediatric telehealth where appropriate.

Geriatric Telehealth (SOS pp. 32-39)

24. Telehealth programs should be used to support palliative home care initiatives.
25. Remote, wireless monitoring (e.g., personal alerts, caregiver and patient support, 'smart' homes and clothing) should be investigated for both enhanced independent living and geriatric healthcare applications.
26. Geriatric telehealth applications should be strongly considered as a technology R & D and economic development opportunity.
27. The use of e-prescription applications should be used to increase self-efficacy and compliance, and to reduce adverse effects.
28. The use of low-cost technology solutions (e.g., the telephone) is strongly recommended for Geriatric telehealth where appropriate.

First Nations Telehealth (SOS pp. 40-44)

29. The recommendations provided in the Health Transition Fund project report of 2001 (Health Canada) should be implemented, viz:
    - Increase connectivity to rural and remote communities, and especially Aboriginal communities;
    - Undertake new research further to implementation of successful telehealth initiatives in First Nations and Inuit communities, and regarding the impact of telehealth on costs, health services and human resources;

- ➢ Promote equality of opportunity for telehealth across First Nations and Inuit communities;
- ➢ Increase awareness and understanding of telehealth opportunities among First Nations and Inuit stakeholders;
- ➢ Create linkages between telehealth and other initiatives of the Aboriginal Health Infostructure in order to leverage investments.

30. Health services and information content should be delivered in a culturally sensitive context.

Tele-homecare (SOS pp. 45-50)

31. Telehealth should be considered for application in managing and monitoring chronic heart failure, chronic obstructive pulmonary disease, oncology, diabetes, wound care, asthma, anxiety, and cardiovascular accident.
32. Home Telehealth programs should be used to assist with and transform the mode of delivery of home care. Such programs should be used to support change within the context of the continuum of care, and a comprehensive home healthcare program.

Tele-mental health (SOS pp. 51-54)

33. Tele-mental health, a proven and sustainable telehealth application, should be expanded.
34. The use of low-cost technology solutions (e.g., the telephone) is strongly recommended for tele-mental health where appropriate.

Teleradiology (SOS pp. 55-59)

35. Teleradiology, a proven and sustainable telehealth application in settings of appropriate workload and distance, should be expanded.
36. Teleradiology should be adopted in settings where the need to travel or poor speed of care provision present barriers to access.

Renal Dialysis Telehealth (SOS pp. 60-62)

37. Teledialysis should be evaluated more comprehensively before commitment is made.

Rural and Remote Telehealth (SOS pp. 63-67)

38. Increased access to a broad range of clinical and educational resources should be provided to rural, remote, and underserved populations.
39. Enhanced connectivity to rural and remote communities and residences should be a priority to improve economies of scale in future service and information delivery.

Telerehabilitation (SOS pp. 68-73)

40. Telerehabilitation, which has been demonstrated to show benefits for health care and patients (e.g., speech pathology, transtelephonic exercise monitoring) requires more comprehensive economic analysis.

Conclusions

Overall, valuable data and levels of evidence exist that support telehealth, and that can now be used by policy makers, decision makers, and researchers when making decisions specific to telehealth. These have been summarised in this report. However, evidence of high scientific quality for telehealth applications is still lacking. What has been clearly demonstrated is the feasibility of using telehealth in many clinical areas and for many health, clinical, educational, research, and administrative activities. Many of the same policy and research concerns, issues, and challenges in telehealth that are discussed in current sources existed 10 years ago. These issues should be addressed and decisions made.

Successful and sustainable implementation of telehealth exists when there is greater integration with other information and communications technology initiatives, policy goal-setting, accompanying action steps, and attention to policy barriers. Benefits and successes often result when strategies and planning adopt human resource and user frameworks. For example, health and medical workforce and workflow are issues, together with readiness and ethical considerations. Collaboration, partnership and sharing are central to the advancement and sustainability of telehealth and its potential benefits, as are needs identification, risk assessment, enabling policy, and true public involvement.

Although project findings to date show broad benefits, these are generally associated with feasibility activity, and seldom measure the impact of telehealth on the social determinants of health, for example, poverty, social isolation, independent living, and identified needs of special populations. New evaluation and research activities should employ methodologies which enable the study of such factors. The reviewed literature suggests that the principal driving forces for telehealth have been financial, specialist clinical interest, and proof of technological feasibility. Patients' views and interests, social effects, quality controls and wider organizational effects are seldom considered. Our study shows that there are a growing number of evaluation frameworks for use by policy makers and planners that could be consistently applied; for example, generic evaluation frameworks, benefit-cost analysis and consumer care pattern guidelines, as well as effects-oriented and risk analysis frameworks.

Integration, enablement of telehealth, and recognition and consistent evaluation of the significant potential benefits of telehealth, will greatly enhance health and socio-economic advantages for Canadians.

II INTRODUCTION

Telehealth has become widespread in the last two decades, despite the fact that scientific evidence to support its use has often been lacking. This study was undertaken to contribute to the Alberta Heritage Foundation for Medical Research (AHFMR) 'State of the Science Reviews' program, and provides an information base to assist policy- and decision-makers, and researchers, in their deliberations about telehealth. This State of the Science Report supercedes other telehealth meta-analyses due to its focus on the social, as well as the economic, impact of such technologies. Further, this study is unique in that it provides two documents that are closely linked – a State of the Science Report, and an accompanying Policy Report. This is the first such combined Report to date.

Telehealth has been found to offer important quality of life, health and socio-economic benefits to the people of Alberta and Canada, and can reduce costs and utilization in the health system. This study describes the kinds of benefits that can be achieved and how. Specifically, this study addresses the following questions:

1. What is the socio-economic impact of telehealth as a method of delivery of healthcare and information, compared to that of the status quo? For patients and their families? For providers, programs, institutions and regional health authorities? At the provincial and national levels? For the public in general?
2. What are optimal indicators and proxy indicators for the assessment of the impact of telehealth?
3. What are related recommendations for policy and decision makers?

Terminology in the field of telehealth is evolving with increasing global information-sharing and the growing presence of electronic media in the everyday lives of patients, the public and health providers. For the purposes of this study, telehealth, telemedicine, or e-health are used interchangeably and are defined collectively as "the use of information and communication technology (ICT) to deliver health services, expertise and information over distance, geographic, time, social and cultural barriers"(Reid, 1996). Telehealth encompasses Internet or web-based "e-health", as well as video-based applications. Applications can be live (real-time) or store-and-forward.

The range of ICTs used in the delivery of telehealth includes:

- Telephone, also referred to in some studies as "plain old telephone service" or POTS.
- Videoconferencing.
- Image capture and transfer.
- Internet or Internet protocol (IP)-based / web-based applications.

Telehealth delivery may be supplemented by decision support software or other information/education sources.

Socio-economic indicators include social determinants of health: poverty, social isolation, education, life stress, early life, access to transport, nutrition, access to health services and care; and factors affecting the socio-economic performance of a community: economy, labour markets, innovation, environment, education, health.

The context for this study is the Canadian health care environment with its particular characteristics, including universal access to health care, a population that is aging, widely dispersed (rural / remote), and diverse in composition with varying health needs (e.g., First Nations). Also implied in the study context is consideration of current strategic policy directions in the Albertan/Canadian health sector, such as the principles of providing care at the right time in the right place by the right provider, maintaining individuals' independence and community living, providing consumer choice, and trialling innovative projects in service delivery. These concepts, as well as the study investigators' experience and informed opinion regarding areas of promise for telehealth, led to the development of ten subject areas of focus for this study. These are:

1. Paediatrics telehealth
2. Geriatrics telehealth
3. First Nations telehealth
4. Tele-homecare
5. Tele-mental health
6. Teleradiology
7. Renal dialysis telehealth
8. Rural and remote telehealth
9. Telerehabilitation
10. Telehealth Reviews

A systematic review of the literature in each of these areas was undertaken, as well as a formal economic analysis of all pertinent articles within each subject area. In addition, a review of policy-related articles and sources was completed.

The study consists of three volumes:

Volume One: State of the Science Report. The State of the Science Report contains a description of the literature search strategy and the process established for selecting and reviewing sources, and a thorough analysis of the literature in each of the subject areas, including systematic reviews. It also incorporates an economic analysis, organized and summarized by subject area, and a series of recommendations drawn from both reports.

Volume Two: Policy Report. This report includes background information on Alberta, Canada, and global telehealth policy, a summary of the results of the State of the Science Report, a description of the policy development process (the policy awareness and engagement process as well as the review process for the policy articles/sources), results of the policy review, and recommendations drawn from both reports.

Volume Three: Appendices. This volume contains four issues of appendices supporting Volumes One and Two. The appendices include detailed information about the study process and a systematic review of all articles in each subject area, as well as all economic- and policy-related articles included in this study.

III TELEHEALTH POLICY BACKGROUND

In its broadest sense, health policy refers to decisions for determining present and future objectives pertaining to the health care system. But when endeavouring to clearly identify what constitutes specific policy there is diversity of opinion. For example, statements of where a particular jurisdiction *intends* to go with telehealth is not the same as legislation that *prescribes* where that jurisdiction will go. Somewhere between these two extremes lie standards, guidelines, and regulations. 'e-Health policy' was recently defined as "*a set of statements, directives, regulations, laws, and judicial interpretations that direct and manage the life cycle of e-health*" (Scott et al, 2002).

Canada, and Alberta in particular, can be considered to have experienced considerable policy support for telehealth, but in terms of specific telehealth guidelines, regulations, or laws (e.g. addressing cross-jurisdictional licensing issues for healthcare professionals), limited policy exists. In general, remarkably few telehealth policy related documents or publications are available, and those that exist warn of the urgent need to address the issue.

This policy void is of concern. The introduction of any new technology that has the capability to permit easy cross-jurisdictional interaction, where previously there was little or none, will have profound impact on many health related policy issues. Telehealth, inherently, has the technical capability to transgress all existing geo-political, socio-economic, cultural, and temporal boundaries. As a consequence telehealth, if developed appropriately, offers unprecedented opportunity for increasing access and addressing issues of equity. However, achieving such goals is already being hampered and impeded by the lack of telehealth policy. Of greater concern is that introduction of hasty, uncoordinated, introspective, or restrictive policy could preclude cross-jurisdictional telehealth entirely.

1. Telehealth Policy in Alberta

Alberta Wellnet is most directly involved with telehealth activities, and is the umbrella for a series of province-wide and regional initiatives to build an integrated health information network in the province. Alberta is also a member of the Western Health Information Collaborative (WHIC). Initiated by the Western Premiers and Deputy Ministers of Health, WHIC exists to explore collaborative opportunities with respect to health infostructure initiatives, and might also serve as a nexus for collaborative policy development.

The most significant policy document for health in Alberta is the recent 'Mazankowski Report' (Premier's Advisory Council on Health for Alberta, 2001) and the Alberta Government's response (Government of Alberta, 2002). A review of the recommendations described in the Mazankowski Report shows many areas in which telehealth will have an impact. For example, of the ten groups of recommendations for reform, eight contain some element or specific recommendation related to telehealth or having relevance to development of telehealth policy. Examples would include: providing Albertans with better information about how to stay healthy; reducing waiting times by introducing centralized booking, posting waiting times for selected procedures on a website; investing in technology and establishing an electronic health record; providing long term funding for technology and information technology systems; continuing to support research, evidence-based decision making, and Alberta's role as a leading centre of health and medical research. Little is said about policy, other than to note that some health decisions "... are not necessarily guided by the best information, but are instead made for a variety of reasons including past experience, expediency, political influences, or to comply with the wishes of health professionals or other health organisations". This underscores the importance and value of well-conceived policy.

2. Telehealth Policy in Canada

Many telehealth initiatives are currently underway in Canada, both at a local and national level. Almost all federal, provincial and territorial governments across Canada have a strategic information systems initiative (e.g. HealthNet/BC, Alberta Wellnet, Saskatchewan Health Information Network, Smart Systems for Health, Inforoute Santé, Nova Scotia Telehealth Network).

Canada has enjoyed considerable policy debate and leadership with regard to telehealth. Our telehealth history formally began in 1994, when the Information Highway Advisory Council (IHAC; 1994-1997) was created and mandated to investigate the development and use of the information highway for the economic, cultural and social advantage of all Canadians. The 1995 IHAC report provided 300 recommendations, and also identified 15 public policy issues (Industry Canada, 1995). One recommendation called for the creation of an advisory council to identify new information technology applications for the health sector. Also, the National Forum on Health (NFOH, 1994-1997) concluded that a prime objective should be the rapid development of an evidence-based health system, and that a nationwide population health information system should be created (Health Canada, 1997).

In 1997, the Advisory Council on Health Infostructure (ACHI, 1997-1999) was established. Its final 1999 report reaffirmed the need and advantages of setting up a nationwide health information highway, particularly with regard to improving quality, accessibility, and efficiency of health services across the entire spectrum of care in Canada (Health Canada, 1999). That same summer, Health Canada also established the Office of Health and the Information Highway (OHIH) as Health Canada's focal point for the use of information and communication technologies (ICTs) in the health sector. The strategic orientations for OHIH were identified as knowledge development, partnerships and collaboration, and federal policy development.

Also in 1997, the Canadian Network for the Advancement of Research, Industry and Education (CANARIE, now CANARIE Inc.) issued a vision paper describing a Canadian health "Iway" (CANARIE Inc., 1997). In 1999 the Advisory Committee on Health Infostructure (ACHI; 1999-to date) was inaugurated by the Federal / Provincial / Territorial Deputy Ministers of Health. The ACHI has working groups that address five priorities: strategic planning, telehealth, protection of personal health information, health surveillance, and electronic health records (F/P/T Advisory Committee on Health Infostructure, 2000). A recent ACHI report (2001) contains recommendations and action steps intended to allow health jurisdictions to move forward significantly, and in a collaborative manner, towards the establishment of a pan-Canadian health infostructure (F/P/T Advisory Committee on Health Infostructure, 2001). Notably, this report also acknowledged that "the policies to enable telehealth are still not fully in place especially for provider reimbursement, clinical accountability and professional licensure. Regardless, telehealth implementations are increasing across the country, with a significant increase in activity during the past 24 months".

In 2001 the Government of Canada committed to an investment of $500 million to create and fund an independent corporation mandated to accelerate the development and adoption of modern systems of information technology, such as electronic patient records, so as to provide better health care (OHIH, 2001). The culmination of this funding initiative was the founding of the Canada Health Infoway Inc. (Infoway) in 2002.

More recently, in November 2002, Roy Romanow, Chair of the Commission on the Future of Health Care in Canada and former Saskatchewan premier, released his report entitled, "Building on Values: The Future of Health Care in Canada – Final Report" (Romanow, 2002). The report provides a prescription for significant reform of the Canadian healthcare system. It outlines five special transfer funds to assist with health care reform:

1) a Rural Remote Access Fund,
2) a Diagnostic Services Fund,
3) a Primary Health care Fund,
4) a Home Care Fund, and
5) a Drug Fund.

Telehealth or e-health solutions can play a large role in these areas, as well as in other priorities defined within the Report; for example, the supply, distribution, training, and changing skills/roles/responsibilities of health care providers; waiting lists; electronic records; health technology assessment; and applied research. Directly related to this State of the Science Report, and in the context of transformative change, the Romanow Report underlines the important roles that research and evidence play in making informed decisions and in guiding future e-policy.

Throughout telehealth's development in Canada, the need for appropriate policy has been acknowledged, and responsibility for its development has been given to various groups. OHIH has responsibility for several policy development activities, and is directly responsible for the development of federal telehealth policy. Their key policy areas are: Integrated Provider Solutions, Protection of personal health information, Telehealth issues of licensure and reimbursement, and Change management.

3. Global Telehealth Policy

The cross-jurisdictional nature of telehealth makes it imperative to develop domestic policy with an eye to international policy, and vice versa. For this reason, it is important to place Alberta's and Canada's telehealth policy position in perspective. All developed nations are facing similar healthcare issues and are equally concerned about their fledgling telehealth systems. For example, a recent report identified at least eight other countries that have national health information and technology strategies either in place or being developed: UK, New Zealand, USA, Italy, France, Japan, and Germany (F/P/T Advisory Committee on Health Infostructure, 2000). In other work, 20 countries were identified as having some defined telehealth policy or clear policy activity (Scott et al., 2002). Examples are:

Legislation

The US has legislation in regard to reimbursement policy, but in almost two years of implementation has reimbursed a total of only $20,000 for 301 teleconsultation claims (Puskin and Kumekawa, 2001). Inter-State licensing issues are increasing in significance, and some compacts have been developed in an attempt to address this. In the world of global telehealth, Malaysia stands out. It has a 20-year ICT plan termed the Multi-Media Corridor initiative, and is the only country to have clear legislation, with both a Telemedicine Act, and specific National Telehealth Policies (Malaysia, 2002a and 2002b).

Policy Guidelines

A few countries possess policy statements that guide their telehealth infrastructure development. For example, like Canada, Australia views telehealth as a priority, and has developed strategy documents to develop it further (National Health Information Management Advisory Council, 1997 and 2001). They have also investigated telehealth policy in other countries (Milstein, 1999). Within the European Union (EU) many telehealth activities flourish, funded by both national governments and the EU, but policy development lags (TELEPLANS WP4 Report, 2002). Nordic countries have developed guidelines, and the UK has some nascent guidelines. National telehealth policy in some countries is absent because telehealth is considered a responsibility delegated to regional authorities (e.g. Italy), which raises concern for consistent and complementary policy within some countries.

In summary, the vast majority of the world's 234 populated countries have no telehealth policy. Since policy is meant to guide, this telehealth policy void is a concern that must be addressed in an urgent manner.

IV STATE OF THE SCIENCE SUMMARY

This section briefly describes the evidence and policy implications from Volume One of this research study.

1. Areas of Benefit

Table 1 provides a summary of where the evidence of benefit exists for telehealth applications. The primary socio-economic indicators referenced in the literature are listed across the top row of the table. Subject areas are listed on the left side of Table 1, and the data in each cell represents the number of studies with Good to Fair scientific evidence (based on the 1995 Jovell/Navarro-Rubio rating scale (Hailey et al, 2002)) of the benefit of telehealth as compared to traditional health care delivery methods.

A brief explanation of each of the areas of benefit follows:

1) Access can refer to
    - improved access to health services (assessment, treatment or follow-up) for patients attributable to reduced time or travel costs, increased convenience; or
    - improved access to peer/professional support for health care providers.
2) Cost savings, cost-effectiveness, and reduced health services utilization are all economic benefits of telehealth which can accrue to patients, providers and/or the health system.
3) Educational benefits of telehealth have been proven for patients and families, and health providers.
4) Support can refer to emotional, spiritual and/or informational communication to patients or caregivers by professionals or peers. The quality of life benefits of support may include improved self-efficacy or coping skills, and the ability for individuals to maintain independent living arrangements.
5) Social isolation with respect to patients and families is recognized as one of the key social determinants of health. Professional isolation in a remote community can also be a socio-economic indicator putting the community at risk (i.e., of losing skilled professionals and health services).
6) Acceptability / client satisfaction reflect the perceptions of telehealth users, which can include patients, families and/or providers
7) Several studies have demonstrated improved clinical or functional health outcomes via telehealth as compared with traditional health care delivery methods.
8) Quality of care can be improved through telehealth via enhanced treatment and follow-up.
9) Quality of life can involve self-efficacy and self-care, improved access to information ability to return to work or to perform activities of daily living, reduced life stress. Improved social/emotional support, and reduced social isolation can also be classified as quality of life benefits; however, they are listed separately here because of the volume of studies dealing specifically with those issues.

Table 1 Areas of Benefit of Telehealth Applications

Areas of Benefit:		1	2	3	4	5	6	7	8	9
Subject Area	*Number of studies providing Good to Fair evidence**	*Access*	*Cost / CE / Decreased health services utilization*	*Education*	*Support*	*Social Isolation*	*Acceptability / Satisfaction*	*Health Outcomes*	*Quality of Care*	*Quality of Life*
Geriatrics	16	8	6	3	4		6	3	2	
Paediatrics	24	3	9	1	3	1	2		3	3
First Nations	2			1						1
Telerehabilitation	5		2	1			2		1	3
Tele-Mental Health	16	2	2	3	3	1	2		3	1
Teleradiology	30	10	15					1	3	
Rural / Remote	7		1	1			4		1	1
Tele-Homecare	9	1	6				4		2	2
Renal	0									
Systematic Reviews	17	3	4				4	4	2	

* Note: this denotes the number of studies within each subject area which demonstrated Good to Fair scientific evidence based on the 1995 Jovell/Navarro-Rubio rating scale (Hailey et al, 2002). A number of other studies that did not meet the Good to Fair criteria were also analyzed within each subject area, for content related to socio-economic implications of telehealth, but these studies are not included in this table.

The evidence of socio-economic benefit in each subject area is provided in greater detail in Volume One: State of the Science Report.

2. Telehealth Benefits to Stakeholders

Table 2 provides a summary of the various benefits to health system stakeholders as suggested in the literature.

Table 2 Summary of the socio-economic impact of telehealth on stakeholder groups

Patients and Families • Increased access to services • Personal cost savings, i.e., time and travel expense through substitution of telehealth for face-to-face treatment • Improved or equivalent clinical and/or functional health outcomes and quality of care (as compared with traditional care) • Increased empowerment, patient involvement and participation in care, positive perception, satisfaction • Enhanced self-care skills and potential for patients to live independently in their own homes, particularly for elderly and disabled persons • Quality of life benefits, including reduced life stress, improved access to information, social and emotional support, and reduced social isolation • Education	**Providers** • Improved efficiency in work – If it is the provider that travels to provide care to remote patients (e.g., satellite clinics), then telehealth can result in travel time savings and providers are able to see more patients. – If it is the patient that travels to a central site to receive services, then telehealth, which may represent increased convenience for patients, can have a positive impact on no-show rates. • Improved access to professional/specialty support, particularly for rural/remote providers, and associated with this: reduced social isolation and enhanced skills • Increased access to educational opportunities and skills development
Programs • Improved cost-effectiveness of health programs delivered to specific populations. • Reduced costs of direct care, medication costs, etc.	**Regional Health Authorities / health organizations** • Cost-effectiveness, through, for example – reduced utilization of health services (i.e., reduced hospitalization rates, reduced utilization of outpatient services, emergency services) – reduced costs of patient transport from remote locations – reduced costs of service delivery • Alignment with strategic policy; for example: in accordance with patients' preferences, enhancing their ability to live independently and stay in their homes as long as possible
The Public • Retention of health services professionals; sustainability of health services in smaller, rural/remote communities; economic viability • Increased choice / more options in health care • Enhanced prevention and health promotion initiatives which can be offered via telehealth feasibly and cost-effectively	**At the provincial and national levels** • Positive impact on health human resources recruitment and retention • Alignment with current policy and strategic initiatives, including – support for primary care – new, innovative ways of delivering health services – prevention / health promotion – complementary to electronic health record (EHR) development and implementation

The State of the Science Report has led to the development of a number of recommendations specific to the subject areas identified in this study. In addition, there was valuable information from policy-related studies with respect to telehealth benefits, implementation and sustainability in general, and in relation to some applications in particular. The following sections V and VI describe the policy review and development process and the results found in the policy literature.

3. Applicability to Alberta

Alberta remains one of the most active and advanced provinces of Canada in terms of telehealth. It is essential that future plans take advantage of available evidence in regard to appropriate areas of telehealth for implementation or expansion. Each chapter of the State of the Science Report (Volume One) concluded with a section on its 'Applicability to Alberta'. The main benefits identified in these sections were: improved access, cost effectiveness, improved clinical outcomes, enhanced quality of care, and satisfaction with care. These benefits accrued for several telehealth interventions. Those interventions that show the most promise for application or expansion in Alberta are summarised below.

Telephone-based interventions
Often overshadowed by more sophisticated applications, these were found to positively impact access, outcomes and quality of care. Relevant programs may include disease monitoring (e.g. blood pressure, temperature, glucometer readings), counselling and/or support, telephone triage, help lines, and automated reminder calls. Tele-echocardiography – that is transmission of echocardiograms via regular telephone lines – is well established and has been shown to be cost-effective for remote communities.

Videoconferencing
For some patient populations, videoconferencing can be used for remote clinical consultation for patient assessment, treatment, follow-up, and management. Potential socio-economic benefit has been shown, particularly in the areas of paediatrics, geriatrics, psychiatry, dermatology, and chronic disease management (e.g. telehomecare). Video consultation has been used effectively by health care providers and patients across the continuum of care, including emergency, acute care, rehabilitation, home care, and palliative care. Videoconferencing has also been used effectively for patient education, and for continuing education and support for professionals in remote areas.

Image transmission
Teleradiology and tele-ultrasound, with or without real-time video consultation, are widely used and accepted telehealth applications. A number of programs were found to offer cost savings and socio-economic benefits in the area of neurosurgery. Other clinical areas where teleradiology has been tested and could be applied in Alberta include emergency medicine, cardiology, urology, oncology and gynaecology. Tele-ultrasound might be re-addressed within Alberta.

Computers and the Internet
These can play a role in remote delivery of interactive health education and promotion programs, on-line support groups, and communication links between patients and providers for the purposes of education, monitoring, and/or follow-up. These applications can be designed and delivered for caregivers as well as patients.

From the perspective of this Policy Report, the most significant issues applicable to Alberta are the telehealth policy void, and the need to satisfy the telehealth / telematics commitments made in Alberta's response to the Mazankowski report. Many studies continue to highlight inter-jurisdictional policy issues (legal, ethical, privacy, etc.), and the current lack of leadership in this arena, as barriers to broader application of telehealth solutions. Eight of the ten groups of recommendations accepted by the Alberta government from the Mazankowski report contain some element inter-related to telehealth implementation or R&D. The applicability to Alberta of these aspects is clear.

V POLICY REVIEW PROCESS

1. Awareness and Engagement process

A local Policy team was assembled to develop and inform the policy section of the study. Members of this Policy team are listed in Appendix A.

Wider awareness and engagement were identified as critical aspects of the policy component of this study. An environmental scan, including discussions with the local team, was performed to determine existing frameworks for policy engagement. No established frameworks were identified. The local policy team thus developed its own strategy for engaging policy and decision makers, with assistance and feedback from Dr. Jacques Magnan and Dr. Doug Wilson, Alberta Heritage Foundation for Medical Research (AHFMR). The first five of the six steps of the policy strategy have been completed:

1. A list of awareness and engagement opportunities for key policy and decision makers was developed:
   - Participate with our team in the development of an optimal engagement policy
   - Obtain further information about the study, either in person or in writing
   - Visit our web site to receive ongoing bi-monthly progress reports
   - Receive executive summary of final report
   - Attend the Summer Telehealth Research Institute, which had a session dedicated to this topic
   - Engage in audio/video teleconferencing sessions around specific issues related to the study
   - Request open houses, road shows, presentations
   - Advise on appropriate press releases

2. Members of the local policy team identified key provincial/territorial and federal policy and decision makers.

3. These identified persons were sent a letter which described the study, suggested the opportunities listed above, and asked for their input, expertise, and participation in framing recommendations. These individuals in turn identified additional contacts, who were approached in the same way. The complete list of Policy Working Group Contacts is given in Appendix C.

4. All Policy Working Group Contacts were provided a study update in early October, 2002. A number of individuals provided feedback on the project.

5. Selected contacts with expertise in specific subject areas of the study were approached for guidance in developing content and in framing recommendations.
   - Sharlene Stayberg, Telehealth Director, Alberta Wellnet, and the Provicial Telehealth Geriatric group, regarding the Geriatric Telehealth chapter
   - Dr. Al Cook, Dean, Faculty of Rehabilitation, University of Alberta, regarding the Telerehabilitation chapter
   - Ernie Dal Grande, Telehealth Program Manager, First Nations and Inuit Health Branch, Health Canada, regarding the First Nations chapter

- Marty Landrie, Aboriginal Mental Health, Adult Services Coordinator, Alberta Mental Health Board, regarding the First Nations chapter

6. Other components of the policy awareness and engagement strategy include:
   - Design a one-page summary of the project for circulation at upcoming conferences and workshops. Two abstracts and two presentations have been prepared and disseminated; one for the Canadian Society for Telehealth conference, Vancouver, British Columbia, October, 2002; the second for the National Telehealth Research Summer Institute, Calgary, Alberta, Summer, 2002.
   - Invite feedback from policy and decision makers on the Final State of the Science and Policy Reports (initiated in Novembe with the interim report and to continue in 2003 after submission of the Final Report to the Alberta Heritage Foundation of Medical Research, January 17).
   - Circulate the State of the Science and Policy Reports through the SEARCH network (http://search.cche.net) and the Alberta Wellnet Provincial Telehealth Committee (web site). (Will be initiated at the end of October, 2002.)
   - Share the tele-homecare package with Canadian and German colleagues, as part of a Germany-Canada Telehealth commitment.

2. Critique of Policy Sources

Policy sources were originally identified in the literature search which has been described in the State of the Science Report. The literature search grouped abstracts into 10 subject areas (see p. 20).

As investigators reviewed articles and sources in these subject areas, they referred policy- and economic-related sources through the central office to the investigators responsible for the policy and economic analyses.

The following information was abstracted from all policy sources included in this report, as per the Cochrane Collaboration Review Manager framework (website: http://www.cochrane-net.org/revman/):

- Article / Title / Author / Year / Country / Location
- Study Design
- Modality
- Participants: age / gender/ groups
- Intervention / Exposure
- Outcomes / Socio-Economic Indicators
- Strength of study
- Policy Recommendations
- Applicability to Alberta

Analysis of policy sources can be found in Appendix P: Critique Policy

The strength of the policy studies (level of evidence) was judged as low, moderate, or high based on the expert opinion of the reviewer, using predetermined criteria including:

- knowledge of telehealth and the Alberta context;
- logical and comprehensive flow of information in the paper; e.g., did conclusions relate directly to objectives?
- quality of the study and source.

Readers can refer to the reference sections in the State of the Science and Policy Reports or to Appendix R: Bibliography, for a complete list of articles and sources reviewed in the development of both Reports.

3. Strengths and Limitations of this Study

The primary strength of the study was the varied and extensive expertise and experience of the project team, which consisted of the principal investigator and five other investigators, a research librarian, a local policy team of eight telehealth, information and communications technology (ICT), public health, and epidemiology researchers, policy leaders and strategists; as well as project managers and assistants. The list of project team members, their titles and qualifications, can be found in Appendix A: Project Team Members, Advisors and Assistants.

Midway through the project (Summer, 2002), a Policy Working Group, consisting of federal/provincial/territorial policy- and decision-makers, was identified through key contact referrals. This group was made aware of the study, its purpose and objectives, and many of these individuals provided valuable contributions in terms of policy implications and interpretation, and development of the results framework.

A comprehensive and exhaustive literature search enabled the team to identify a consummate body of literature related to the two key subjects of the study: 1) telehealth and 2) Social Determinants of Health / socio-economic indicators. Clearly outlined research questions and review processes enabled the effective progression of the study.

There are three limitations to this study which should be mentioned. Firstly, State of the Science Program limitations precluded the ability to have two reviewers assess each paper in this study. Once abstracts were grouped by subject area (i.e., Paediatrics, telerehabilitation, etc.), the subject areas were divided amongst five investigators and the task of selecting and reviewing articles relied upon the individual expertise and experience of one of five investigators. To mitigate any potential differences in selection and review processes, criteria were developed and the team met regularly to review progress and to discuss and resolve particular issues or concerns.

Secondly, systematic reviews could not be assessed for strength of evidence as no rating system was available. The search strategy for telehealth review sources identified both systematic reviews and literature reviews, which are differentiated within the reviews analysis. A paper can be called a systematic review if it satisfies certain criteria, such as clear research question and associated transparent search strategy, and inclusion/exclusion criteria.

Thirdly, the subject areas identified for this study represent promising areas for telehealth application based on current health needs, initiatives, and recognized health system priorities. Consequently, evidence pertaining to each subject area and the ensuing recommendations cannot be generalized across subject areas or to the population as a whole. For instance, evidence and recommendations related to a medical condition in Geriatrics cannot be applied to the same medical condition in adults. Wherever evidence or recommendations have been provided which relate to a particular population group, this has been specified.

VI RESULTS OF THE POLICY REVIEW

The review of policy studies, as well as policy implications from the State of the Science Report, led to the development of six main strategies for successful and sustainable implementation of telehealth. These are:

1. Integration,
2. Policy goal-setting,
3. Recognition and resolution of policy barriers / challenges in telehealth,
4. Collaboration, partnerships and sharing,
5. Identification of high-impact areas for telehealth, and
6. Evaluation and research.

1. Integration

Telehealth projects are often conceived, implemented and evaluated as stand-alone initiatives. Health providers' and patients' experiences with pilot projects have further entrenched this view. It is necessary that policy and decision makers within the health system, as well as administrators, providers, patients and the public come to see telehealth as part of the bigger picture of health services delivery. Mitchell (2000) states that telehealth is more likely to be cost-effective and sustained if it is seen as part of the larger domain, that is, e-health – the use of telecommunications technologies (video-conference, telephone and Internet) with information technology (computer databases, image capture, electronic ordering, storage & retrieval systems).

Enhanced health and cost benefits can be achieved by leveraging telehealth programs with other emerging telecommunications / information technology innovations.

Examples of integrated telecommunications and information technology are:

- a nurse-managed telephone-based health monitoring and patient education program aided by a computerized decision-support system;
- an in-person local provider-patient clinical consultation, where a distant specialist attends or can be summoned if needed via video-conference; with biomedical telemetry to transmit clinical data;
- a support network for caregivers involving an informational computer program and e-mail communication with peers and/or professionals.

A key principle for integration is to make telehealth part of an organization's strategic plan, rather than just being introduced in a series of demonstration projects.

In addition, a communication plan, working to increase awareness of telehealth among health care providers, educators and consumers to better integrate telehealth into the health care system, will help in changing the perspective of it being an 'add-on' service, and in informing potential consumers of more choices in health care. A communication plan should include national and provincial policy statements, as well as research and evaluation findings on telehealth.

2. Policy Goal-setting

Ricketts (2000) found that in the hospital setting, market-driven changes are more dominant than policy-directed reform (in terms of implementing new technologies). One implication of this observation is that cost-effectiveness should be a key criterion in selecting telehealth applications. However, it need not be the primary nor even a major criterion in all cases. Menolascino (1989) emphasizes that establishing a guiding philosophy in planning a telemedicine program is key to success. Improving cost-effectiveness in health services delivery may be one example of this, but so may improving access to health care for remote/underserved populations. It is possible for the two principles of cost-effectiveness and access to be consistent, but improving access can also be seen as possibly increasing costs from a health system point of view – even if it reduces costs from a societal point of view (i.e., including private costs faced by patients as well as program costs). Such an example illustrates the need for a clear guiding principle that considers all of the potential impacts of a particular telehealth program. It also demonstrates the need to be clear about the perspective being adopted (i.e., patient, provider, health system, society).

3. Recognition and Resolution of Policy Barriers / Challenges in Telehealth

There are a number of issues that are frequently mentioned in policy papers and in scientific studies that are limiting the success of programs and constraining the widespread adoption of telehealth. Some of the most problematic are:

- Professional issues of credentialing, licensing, and registration;
- Legal issues of privacy and security;
- Ethical issues of confidentiality, consent, and authorization (data access);
- Reimbursement and other operational (funding);
- Accreditation;
- Commercial issues of intellectual property and copyright;
- Interoperability (technical, professional, organizational);
- Communication issues such as cross-border acceptance, use of common 'language'.

Policy and decision makers, and telehealth project leaders, are working to address these issues but comprehensive solutions have not been established. Professional associations need to continue to be involved in setting standards for the technology used in telehealth applications in specific areas (e.g.: teledermatology, telepsychiatry), and in resolving the issues of professional competence, credentialing and licensing in the provision of telehealth services. Health regulatory bodies also need to be involved in policy decision-making in order to expedite regulatory changes to move telehealth forward.

Ashcroft and Goddard (2000) address some of these challenges in their article "Ethical issues in teleradiology". They recommend clear contracts between the user and provider of teleradiology advice, specifying:

- minimum standards of training;
- medical qualifications;
- liability, insurance and negligence;
- Total Quality Management (TQM) standards;
- clear and binding financial arrangements;
- standards of data protection and patient confidentiality;

- regular technology assessment, including economic evaluation.

This article is a concise resource for use when implementing a teleradiology program, or when developing research projects and/or policy.

Another challenge that needs to be addressed in implementing telehealth is the human factor. Development of strong, trusting inter-professional relationships and provider-patient relationships may require more time and effort, or different techniques, or may even be more essential in a telehealth setting, as opposed to traditional health care delivery settings. Without strong interpersonal relationships, telehealth programs may break down. In order to develop strong relationships, the following strategies may be useful:

- Understand provider and patient expectations;
- Communicate (and, ideally, achieve a common understanding of) the goals and objectives, rationale, benefits and limitations of the telehealth program to all users (patients, providers, technicians);
- Provide training and education.

Telehealth has an impact on human resources. Health and medical workforce implications associated with the advancement of information technology and telecommunications in health care include: overall numbers, mix of health care providers (HCPs), geographical distribution of HCPs, changing professional boundaries and changing skill requirements of HCPs (Swanson 1999). It is important that provincial and national policy and decision makers be forward-thinking in health human resources planning.

Another human factor in the success of telehealth is "readiness" of both communities and health organizations. Community readiness refers to the level of experience and acceptance that that public has with respect to technology. Campbell et al (2001) describe three levels of community readiness and suggest approaches to the introduction and implementation of telehealth in each case. In assessing readiness, it is important to understand perceptions of patients, as well as providers. From the provider viewpoint, telehealth has the potential to open up new markets for urban specialists. On the other hand, a US study reports that rural physicians facing competition from their urban counterparts may view telehealth as a threat to their livelihoods and resist implementation or use of telehealth programs in their community (Sinha, 2000).

Organizational readiness is related to the health delivery processes, procedures, and standards that are in place and how a telehealth program fits with these. It may be necessary to orient staff to new ways of doing things in order to effectively accommodate telehealth. Wheeler (1998) proposes that a critical success factor for telehealth will be redesigning the way care is delivered while maintaining or improving the quality of care.

Overcoming many of the barriers to telehealth that have been discussed here involves openness to change on the part of individuals, health care providers, health organizations / Health Regions, and provincial and federal governments.

A final point related to ethical considerations, introduced by Preston et al (1992), is the notion of an organization being held liable for NOT offering telehealth. This is a 'new twist' that Alberta may want to consider in terms of the legal implications of developing new programs and in policy planning.

4. Collaboration, Partnerships and Sharing

There are significant opportunities for improvements in efficiency and patient care through inter-jurisdictional sharing of skills and services via telehealth. Canadian health care decision makers need to examine existing stove pipes and take every opportunity to share resources across regions and to integrate existing systems and institutions

There can be advantages to collaboration between industry and health care organizations. These may include opportunities to trial technologies in a particular setting (e.g., if there are doubts as to the generalizability of the proven benefits of a given telehealth application to the local setting, or its interoperability), and the ability to communicate local needs and required adaptations to a technology provider.

There needs to be broader inclusion of the public in decision-making regarding telehealth options. There is evidence that the public is willing to trade-off some aspects of traditional health care (e.g., in-person specialty follow-up consultations) for the advantages of telehealth (faster access to care, less personal travel expense).

5. Identification of High-Impact Areas for Telehealth

Needs assessment

Evidence from the State of the Science Report indicated that telephone-based applications can be cost-effective and can improve access, outcomes, and satisfaction with care in certain populations. While video-based application tends to be the better known telehealth concept in Alberta, education and administration are currently the two greatest uses of these systems, with minimal growth in clinical services. This may be explained by some of the barriers identified previously, such as:

- unresolved medical-legal issues associated with video-based clinical consultation,
- inadequate/incomplete reimbursement for clinical consults via video,
- the need for better integration of the video-based clinical consultation with the electronic health record and data transfer in general.

However, the question remains as to whether education and administration are the areas of greatest need for telehealth services and if these are the areas where the greatest impact on health and social outcomes will be realized.

Improved access for remote and underserved populations is generally recognized as a priority in telehealth. Goldsmith and Ricketts (1999) devised a method of combining the designations of 'Medically Underserved Population' and 'Health Professional Shortage Area' based on the following variables:

- Population count,
- PCP count,
- Percent of population with income <200% of poverty level,
- Percent of racial minorities,
- Infant mortality rate and low birth weight,
- Percent of population linguistically isolated,
- Population density,
- Other variables.

This framework may be useful in assessing/determining need for specialized telehealth programs.

Risk Assessment

Risk assessment is an important component of program planning. While some program limitations can be anticipated and accommodated, there can be unexpected socio-economic impacts of telehealth on a community. Program evaluation must be open enough to capture these so that they can be investigated and understood.

An example is the issue of independence versus social isolation. Technology may lead to increased independence for patients, specifically in the home, but it also has the potential to lead to increased social isolation if the need to go outside of the home to seek services or support is obviated, or if carers are replaced with technology. This issue is particularly important in the context of tele-homecare. The implementation of programs must consider the needs and choices of individual patients in the wider social context.

Considering risk in a broader perspective, decision makers need to be cognizant of the policies being developed / recommended and of the ways in which these polices are expected to drive change in our health care system, versus actual effects. For instance, Taylor (1999) in the article: "Do Targeted Efforts for the Rural Underserved Help Kill Comprehensive Reform?" suggests that telehealth solutions in rural areas may suspend needed, larger scale response to the problems of equity in health care access. Associated with this concern is the following US-reported notion: that an unintended (possibly undesirable) long-term effect of telehealth may be to further concentrate health specialists and resources into urban centres, resulting in reduced direct access to health services for small/remote communities and increased isolation (Sinha 2000).

A concern presented by Swanson (1999) is that "the likely social effects of the advancement of information technology and telecommunications in the health care field in Australia are 'location independence' of a range of activities and widening gaps between the 'information rich' and 'information poor'". The suggestion is that most of the underserved groups will fit into the 'information poor' category.

6. Evaluation and Research

The telehealth literature tends to focus mainly on health system costs and personal time and travel considerations, as opposed to a broader range of socio-economic indicators. Of particular interest to this study, but also absent in the literature reviewed, is the direct measurement of the impact of telehealth on the social determinants of health, i.e., poverty, social isolation, education, life stress, early life, access to transport, and nutrition. New research should employ appropriate methodologies for studying and answering these questions. In addition, new frameworks for economic analysis need to be developed which can capture non-monetary and unintended consequences, as well as monetary measures.

The principal driving forces for telehealth have been financial, specialist clinical interest, and proof of technological feasibility. Patients' views and interests, societal effects, quality controls and wider organizational effects are seldom considered (Roberts, 1998). There are, however, studies that note the importance of conducting telehealth research that is focused on aspects beyond financial considerations, suggesting the importance of considering patients' views and interests. Despite the rapid design, innovation and sleek, user-friendly devices, the redefining of health care delivery should still contain a significant application of compassion and caring (Albright and Slater, 2000). Additionally, Fisk (1998) states the need to maximize the acceptability and usability of telecare to meet the social objective of independent living. Also to be considered are the needs of special populations (including Aboriginals) (Lessing and Blignault, 2001), and those who do not have equal access to health care (Jukic and Bifulco, 1999).

Hayes (1998) suggests that there is a need for further research to explore the factors that contribute to organizational readiness for successful implementation of telemedicine. Campbell et al (2001) may be a useful resource in assessing readiness.

Because it takes time to observe a measurable change in socio-economic indicators and particularly in the social determinants of health, research on the impact of telehealth on these factors requires a longer time span in order to produce sound and quality evidence.

Research Questions

Preston et al (1992) is a useful resource regarding research design and development of researchable questions. Capalbo (1999) suggests that a key method of assessing the value and effect of telehealth is by observing how it affects the behaviour of consumers in terms of where and how they seek care. For example, what are the short-term versus long-term patterns of care-seeking; how do care patterns change when a service is altered / added / removed?

Evaluation Frameworks

Capalbo (1999) recommends 'benefit-cost analysis' (BCA) as a framework for analysis for telehealth, with consideration of the disparate distribution of costs and benefits on different parties, e.g., patients, physicians, other health care providers and tax-payers. Similarly, Baer (1997) suggests a framework for evaluation in a 3x3 matrix formed by accessibility, cost, and quality against client, provider, and society. Angaran (1999) is a good resource document for the development of an effects-oriented framework and risk analysis framework for evaluating telehealth.

It is important for professionals in this field to share information about their experience and to examine the results of evaluations to speed up suitable development work (Riva and Gamberine, 2000).

The following dilemma has been identified: on the one hand, decision makers need to use caution in implementing telehealth programs based on the quality of the existing evidence. On the other hand, evidence from some studies, despite the quality of the study design, can provide guidance on selected programs that appear to be appropriate applications. For instance, certain telehealth applications, which may or may not have proven cost-effectiveness, can benefit remote or underserved communities by increasing access to service.

7. Investment

In l997, the Industry Canada Sector Competitiveness Framework Report predicted that Canadian governments would spend $500 to $750 million over five years in telehealth applications. This included new and on-going projects and their associated infrastructure. Investments have far surpassed this estimate! The 1998 Business Communications Company Report estimated that current U.S. market for telemedicine at $65M, to reach $3B by 2002. Alberta's strategy to grow its "innovation-based economy" into the 21st century targets total R&D investment of $3 billion by 2010, and 0.5% of the global market around advanced networked environment products; i.e. the milieu in which telehealth sits.

Given the size of such endeavors, the Government's research and science strategy has recognized that "content and applications for the health care sector must be thoroughly researched and evaluated to ensure appropriate investment". That is, telehealth research, as in this SOS study, is critical to accurately assess Return on Investment or Return on Value, and to provide the needed evidence and guidelines for decision makers in Alberta to consider. In addition, as telehealth research provides the bridge between private sector and practice environments (by moving knowledge into practice, and new products into commercialization), it is viewed as a major key to advancing the area of investment.

Training and employment opportunities are an important element of "Investment". In the early 2000's, Industry Canada reported that over 350 Canadian Telehealth companies employed about 1700 people, and had annual revenues of nearly $30 million. The private sector continues to hire in the telehealth field as it strives to conduct ongoing R&D to remain at the leading edge, commercialize telehealth products, and forge new markets. Business links in developing and implementing telehealth solutions provide hands-on training and industry exposure and contribute to the training of high quality personnel through internships, apprenticeships, mentoring, and field research exchange opportunities. Further, numerous job and career opportunities are available for telehealth trainees within the public, professional, and academic sectors. In a 2000 study of 42 Canadian health organizations, 59% had IT job vacancies and 66% had difficulty recruiting/retaining IT staff.

Taken together with the findings from this study, the above perspective leads to the conclusion that investment in telehealth is appropriate, and if performed correctly offers significant R&D opportunities.

VII RECOMMENDATIONS AND CONCLUSIONS

General recommendations arising from this study are:

A. Policy

1. To be successful and sustainable, telehealth must be fully integrated into existing health structures and processes in a practical and policy manner.
2. Integration can be achieved through aligning telehealth initiatives with existing strategic health plans, policy goal-setting, accompanying action steps, and resolution of policy barriers.
3. Establishment of a policy forum that focuses on telehealth policy would facilitate these needs.
4. Telehealth applications should incorporate capacity for education, research, and administrative functions, as well as health and clinical functions.
5. Federal-provincial/territorial partnerships in telehealth should be established where there are opportunities to improve efficiency in health care and decrease duplication.
6. As telehealth continues to evolve, input from all key stakeholders (including patients, health care providers, and the public) into policy development is required. Consideration of needs as well as practical experience is essential for a meaningful exchange of information and views.
7. Consistent terminology and definitions around telehealth, e-health and related terms should be adopted across jurisdictions.

B. Technology

8. To facilitate access to many bandwidth intensive telehealth applications increased broadband connectivity is needed, particularly to rural and remote communities.
9. Given the evidence, the use of telephone-based telehealth applications should be re-examined.
10. Technology modalities (broadband, narrowband, web-based) and applications (videoconferencing, data monitoring, telephone) should be viewed as synergistic, not competitive, and the most appropriate tool applied; i.e., hybrid connectivity solutions are recommended.

C. Evaluation

11. Suitable outcome indicators, measures, and reliable and valid instruments for socio-economic benefit of telehealth must be identified, defined, and consistently applied within a recognized evaluation framework that asks relevant research questions.

12. Suitable frameworks for economic analysis need to be developed that capture non-monetary and unintended consequences, as well as monetary measures.

13. Telehealth programs should be implemented and evaluated in a culturally aware and culturally sensitive manner.

14. Evaluations should include examination of the social, organizational, and policy aspects of telehealth.

D. Economic

15. Telehealth demonstrates sufficient evidence of socio-economic benefit to indicate ongoing investment is appropriate.

16. Sustainable telehealth 'programs' and not 'projects' should be targeted.

17. Full integration of telehealth will increase its use and decrease the per contact episode cost.

18. Investment in information and communications technology infostructure should be considered as an investment not only in health, but in business, education, and other e-sectors.

E. Investment Opportunities

19. R & D and economic development opportunities require pursuit.

Subject-specific recommendations arising from this study are as follows:

Paediatric Telehealth

20. Telehealth programs that improve quality of care and offer economic benefit for 'at risk' paediatric populations (e.g., neonates, adolescent asthmatics) should be introduced.

21. Telehealth programs that improve quality of care and offer economic benefit for 'at risk' paediatric populations (e.g., neonates, adolescent asthmatics) should be introduced.

22. Evidence would suggest decision makers should consider telehealth to achieve enhanced social environments for children, and staff efficiencies as related to data transfer.

23. The use of low-cost technology solutions (e.g., the telephone) is strongly recommended for Paediatric telehealth where appropriate.

Geriatric Telehealth

24. Telehealth programs should be used to support palliative home care initiatives.

25. Remote, wireless monitoring (e.g., personal alerts, caregiver and patient support, 'smart' homes and clothing) should be investigated for both enhanced independent living and geriatric healthcare applications.

26. Geriatric telehealth applications should be strongly considered as a technology R & D and economic development opportunity.

27. The use of e-prescription applications should be used to increase self-efficacy and compliance, and to reduce adverse effects.

28. The use of low-cost technology solutions (e.g., the telephone) is strongly recommended for Geriatric telehealth where appropriate.

First Nations Telehealth

29. The recommendations provided in the Health Transition Fund project report of 2001 (Health Canada) should be implemented, viz:

    - Increase connectivity to rural and remote communities, and especially Aboriginal communities;
    - Undertake new research further to implementation of successful telehealth initiatives in First Nations and Inuit communities, and regarding the impact of telehealth on costs, health services and human resources;
    - Promote equality of opportunity for telehealth across First Nations and Inuit communities;
    - Increase awareness and understanding of telehealth opportunities among First Nations and Inuit stakeholders;
    - Create linkages between telehealth and other initiatives of the Aboriginal Health Infostructure in order to leverage investments.

30. Health services and information content should be delivered in a culturally sensitive context.

Tele-homecare

31. Telehealth should be considered for application in managing and monitoring chronic heart failure, chronic obstructive pulmonary disease, oncology, diabetes, wound care, asthma, anxiety, and cardiovascular accident.

32. Home Telehealth programs should be used to assist with and transform the mode of delivery of home care. Such programs should be used to support change within the context of the continuum of care, and a comprehensive home healthcare program.

Tele-mental health

33. Tele-mental health, a proven and sustainable telehealth application, should be expanded.

34. The use of low-cost technology solutions (e.g., the telephone) is strongly recommended for tele-mental health where appropriate.

Teleradiology

35. Teleradiology, a proven and sustainable telehealth application in settings of appropriate workload and distance, should be expanded.

36. Teleradiology should be adopted in settings where the need to travel or poor speed of care provision present barriers to access.

Renal Dialysis Telehealth

37. Teledialysis should be evaluated more comprehensively before commitment is made.

Rural and Remote Telehealth

38. Increased access to a broad range of clinical and educational resources should be provided to rural, remote, and underserved populations.

39. Enhanced connectivity to rural and remote communities and residences should be a priority to improve economies of scale in future service and information delivery.

Telerehabilitation

40. Telerehabilitation, which has been demonstrated to show benefits for health care and patients (e.g., speech pathology, transtelephonic exercise monitoring) requires more comprehensive economic analysis.

VIII SUMMARY

This policy report has looked into the literature for policy implications of telehealth related to socio-economic determinants of health and also for guidance on how best to integrate telehealth into the mainstream so that benefits can be realized and sustained in the long term. The literature has revealed a focus on certain socio-economic indicators, such as cost, access, and satisfaction. The significance of these analyses cannot be overlooked; however, other indicators that have not been addressed in the literature but where telehealth may have a strong impact on population health should also be considered, for instance, social isolation, life stress, and poverty. This indicates opportunity for research and policy analysis and development. In the broad social context, various stakeholders, including patients, providers, and health organizations, can benefit in unique but related ways from telehealth.

Telehealth must be seen by decision-makers and administrators, and by providers and patients, as more than an add-on service in order for it to become fully integrated into the health care system and for it to reach its full potential. There are various barriers and challenges to the advancement and integration of telehealth including confidentiality, reimbursement, legal and ethical considerations, but there are also important aspects of the "human factor" that need to be addressed, including patient needs and preferences, patient and provider perceptions, relationships, workforce implications, and community readiness. These are a challenge for all stakeholders.

Depending on the health program and goals, there are many different proven telehealth strategies that can respond. For instance, cost-effectiveness has been demonstrated particularly in the fields of teleradiology and tele-mental health. Improved access for underserved populations can be addressed by identified applications in rural / remote telehealth, geriatric telehealth and home telecare. Based on the evidence that exists, this report provides specific, program area recommendations regarding key directions for telehealth in Alberta and Canada. However, sound evaluation of new initiatives must be a component of any project, and avenues must be opened so that innovative solutions can be tested. Therefore, general recommendations pertaining to policy, technology, evaluation, and economic analysis are also provided in this study.

In conclusion, the awareness, but more particularly, the engagement process will continue following the completion of this project. Knowledge of the benefits of the socio-economic impact of telehealth will continue to be provided as we move forward in an eager attempt to engage policy and decision makers in discussion about the future of telehealth.

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APPENDIX A

Team Members

Dr. Penny Jennett – Principal Investigator

Head, Health Telematics Unit; Professor Faculty of Medicine, University of Calgary

Expertise contributed: Extensive experience as a telehealth and health researcher, including leadership positions in data and literature synthesis in telehealth, telelearning and medical/health education.

Role: Direct the project, coordinate the efforts of the investigators and provide independent verification of article selection.

Dr. Richard Scott – Co-Investigator

Associate Professor, Health Telematics Unit, University of Calgary; Fullbright New Century Scholar

Expertise contributed: Diverse experience in review and synthesis of literature; telehealth researcher.

Dr. David Hailey – Co-Investigator

Director, David Hailey and Associates, Canberra, Australia; Professor, Department of Public Health Sciences, University of Alberta, Senior Advisor, Health Technology Assessment, Alberta Heritage Foundation for Medical Research

Expertise contributed: Data synthesis and analysis gained over numerous projects, including three previous non-quantitative reviews in telehealth; specific cost-benefit experience.

Dr. Arto Ohinmaa – Co-Investigator

Associate Professor (Health Economics), Department of Public Health Sciences, University of Alberta

Expertise contributed: Expertise in the area of health economics; significant experience in performing systematic reviews in telehealth as well as years of front-line experience in telehealth research projects.

Dr. Roger Thomas – Co-Investigator

Family Physician; Professor, Faculty of Medicine, University of Calgary; Cochrane Collaboration Coordinator for the University of Calgary

Expertise contributed: Clinical experience; expertise in sociology, evidence based medicine and systematic reviews; particular expertise in the Cochrane review process.

Carol Anderson – Co-Investigator

Telehealth Consultant, CA Consulting

Expertise contributed: clinical experience; telehealth consultant

Dr. Barbara Young – Co-Investigator

Clinical Fellow in Internal Medicine; Chief Resident General Internal Medicine, McGill University

Expertise contributed: experience in clinical medicine and medical education; interest in rural clinical medicine.

Diane Lorenzetti

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Expertise contributed: advisor on search strategy and Reference Manager software

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Local Policy Team Advisors

Advisors will contribute specific areas of expertise towards implementing a rational review design and drawing relevant conclusions from the results. All advisors will contribute up to five hours per month, with the exception of Ms. Lorenzetti, who will contribute approximately 100 hours over the course of the review process.

Dr. Tom Noseworthy

Intensive Care Physician; Information Communications Technology (ICT) and Policy Researcher, Department of Community Health Sciences, University of Calgary

Expertise contributed: expertise in health care policy and management based on practical and academic experience on multiple administrative levels; special expertise in telehealth

Dr. Steve Edworthy

Rheumatologist; Telehealth Researcher, Health Telematics Unit, University of Calgary

Expertise contributed: clinical experience; special expertise in ICT solutions as applied to the management of chronic diseases and physician offices.

Dr. David Topps

Family Physician; Chair, WONCA Rural Information Technology Exchange; Chair, Rural Practice Committee, College of Family Physicians

Expertise contributed: clinical experience; expertise in systematic reviews and the challenges of rural medicine, specifically as these relate to ICT use in practice.

Janice Hopkins

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Expertise contributed: expertise in national policy as it applies to ICT implementation in the public sector

Dr. Penny Hawe

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Expertise contributed: expertise in policy, public health, epidemiology, psychology and evaluation of health promotion programs

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Dr. Robert Hayward

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Expertise contributed: clinical and ICT researcher within the health sector

APPENDIX A

FINALIZED LIST OF TEAM MEMBERS, ADVISORS, AND ASSISTANTS

Team Members

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Research Librarian, Institute of Health Economics/Centre for Health Policy Studies, University of Calgary
Expertise contributed: advisor on search strategy and Reference Manager software

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Local Policy Team Advisors

Advisors will contribute specific areas of expertise towards implementing a rational review design and drawing relevant conclusions from the results. All advisors will contribute up to five hours per month, with the exception of Ms. Lorenzetti, who will contribute approximately 100 hours over the course of the review process.

Dr. Tom Noseworthy
Intensive Care Physician; Information Communications Technology (ICT) and Policy Researcher, Department of Community Health Sciences, University of Calgary
Expertise contributed: expertise in health care policy and management based on practical and academic experience on multiple administrative levels; special expertise in telehealth

Dr. Steve Edworthy
Rheumatologist; Telehealth Researcher, Health Telematics Unit, University of Calgary
Expertise contributed: clinical experience; special expertise in ICT solutions as applied to the management of chronic diseases and physician offices.

Dr. David Topps
Family Physician; Chair, WONCA Rural Information Technology Exchange; Chair, Rural Practice Committee, College of Family Physicians
Expertise contributed: clinical experience; expertise in systematic reviews and the challenges of rural medicine, specifically as these relate to ICT use in practice.

Janice Hopkins
Director, Knowledge and Policy Development Office, Office of Health and the Information Highway, Health Canada
Expertise contributed: expertise in national policy as it applies to ICT implementation in the public sector

Dr. Penny Hawe
Professor, Markin Chair in Health, Wellness and Society, University of Calgary
Expertise contributed: expertise in policy, public health, epidemiology, psychology and evaluation of health promotion programs

Mr. Steven Lewis
Adjunct Professor of Health Policy, University of Calgary; Health Policy Consultant, University of Saskatoon.
Expertise contributed: many years experience in national and provincial health policy research and research synthesis

Dr. Robert Hayward
Physician (Internist); ICT Researcher, Department of Public Health Sciences, University of Alberta
Expertise contributed: clinical and ICT researcher within the health sector

APPENDIX B

FINAL LITERATURE SEARCH STRATEGY

Database Searching

Thirty electronic databases were searched to locate relevant material on this topic. Search strategies for each database were combinations of standard text words and database-specific subject headings.

What follows are two lists of standard text words that were included in each database search. Although in most cases, terms in Group A and B were combined, in a few instances, as outlined below, only one set of terms was used.

Main Textword Search Terms Used In All Databases

Search Terms Group A

access*[Keyword & Title]
benefit*[Keyword & Title]
clinical AND (followup OR follow-up)[Keyword & Title]
cost*[Keyword & Title]
determinants AND health[Keyword & Title]
economic*[Keyword & Title]
educat*[Keyword & Title]
efficien*[Keyword & Title]
effective[Keyword & Title]
equitable OR equities OR equity[Keyword & Title]
health status[Keyword & Title]
health OR treatment AND outcome*[Keyword & Title]
hospital admission*[Keyword &Title]
impact*[Keyword & Title]
inequities OR inequity[Keyword & Title]
isolation OR isolated[Keyword & Title]
morale[Keyword & Title]
patient admission[Keyword &Title]
patient* AND (care OR treatment)[Keyword & Title]
productiv*[Keyword & Title]
quality of life[Keyword & Title]
quality AND service[Keyword & Title]
remote[Keyword & Title]
rural[Keyword & Title]
social OR societal OR society AND (benefit OR islolation) [Keyword & Title]
socioeconomic* OR socio-economic*[[Keywords & Title]
train*[Keywords &Title]
travel time[Keywords & Title]
wait* AND (list* OR time*)[Keywords & Title]

Search Terms Group B

ehealth OR e-health[Keywords & Title Words]
elearning OR e-learning[Keywords & Title Words]
emedicine OR e-medicine[Keywords & Title Words]
personal digital assistant*[Keywords & Title Words]
remote AND (monitoring OR consultation) AND (medicine OR medical OR health) [Keywords & Title Words]
satellite communications AND (medicine OR medical OR health) [Keywords & Title Words]
telecare[Keyword & Title Word]
telecommunications AND (medicine OR medical OR health) [Keywords & Title Words]
teleconferenc* AND (medicine OR medical OR health) [Keywords & Title Words]
teleconsult*[Keyword & Title Word]
teledermatology[Keyword & Title Word]
teleeducation OR tele-education[Keywords & Title Words]
telehealth[Keyword & Title Word]
telematic*[Keywors & Title Word]
telemedical[Keyword & Title Word]
telemedicine[Keyword & Title Word]
Telemetry AND (medicine OR medical OR health) [Keywords & Title Words]
telemonitor* OR tele-monitor*[Keywords & Title Words]
telepatho*[Keyword & Title Word]
telepediatric* OR telepaediatric*[Keywords & Title Words]
telephone care[Keyword & Title Word]
telepsychiatry[Keyword & Title Word]

teleradiology[Keyword & Title Word]
telescreen*[Keyword & Title Word]
teletherapy[Keyword & Title Word]
television AND (medicine OR medical OR health)[Keyword & Title Word]
videoconferenc* AND (medicine OR medical OR health)[Keywords & Title Words]

Additional Search Terms Used in Specific Database Searches

1. Medline/PubMed
   Publication Dates: 1980 to present
2. CancerLit
   Publication Dates: 1980 to March 2002
3. National Library of Medicine Gateway
   Publication Dates: 1980 to May 2002
4. National Library of Medicine LocatorPlus (Catalogue of NLM collection)
   Publication Dates: to May 2002
5. Health Technology Assessment Database (HTA) – University of York
   Publication Dates: to May 2002
6. Database of Abstracts of Reviews of Effectiveness (DARE) – University of York
   Publication Dates: to May 2002
7. NHS Economic Evaluation Database (NHSEED) – University of York
   Publication Dates: to May 2002

Search Terms Group A

community health services[Major Mesh]
decision making[Major Mesh]
delivery of health care[Major Mesh]
economics[Major Mesh]
education, distance[Major Mesh]
education, medical[Major Mesh]
education, professional[Major Mesh]
efficiency[Major Mesh]
health education[Major Mesh]
health policy[Major Mesh]
health promotion[Major Mesh]
health services[Major Mesh]
health services accessibility[Major Mesh]
health services administration[Major Mesh]
health status[Major Mesh]
morale[Major Mesh]
outcome assessment(health care)[Major Mesh]
patient admission[Major Mesh]
patient care management[Major Mesh]
public health[Major Mesh]
quality of health care[Major Mesh]
quality of life[Major Mesh]
rural population[Major Mesh]
social isolation[Major Mesh]
socioeconomic factors[Mesh]
waiting lists[Major Mesh]

Search Terms Group B

decision making, computer-assisted[Major Mesh]
medical informatics[Major Mesh]
personal digital assistant*[Text Words]
remote Consultation[Major Mesh] AND (medicine or health)[Major Mesh]
satellite communications [Major Mesh] AND (medicine or health)[Major Mesh]
telecommunications[Major Mesh] AND (medicine or health)[Major Mesh]
telefacsimile[Major Mesh] AND (medicine or health)[Major Mesh]
telemedicine[Major Mesh]
Telemetry[Major Mesh]
telepathology [Major Mesh]
telephone[Major Mesh] AND (medicine or health)[Major Mesh]
teleradiology[Major Mesh]
television[Major Mesh] AND (medicine or health)[Major Mesh]

8. CINAHL (Nursing & allied health)

Publication Dates: 1982 to March 2002

Search Terms Group A

community health services[Major Mesh]
decision making[Major Mesh]
delivery of health care[Major Mesh]
economics[Major Mesh]
education, health sciences OR education, medical OR education, nursing[Focused CINAHL Subjects]
efficiency[Major Mesh]
efficiency, organizational[Focused CINAHL Subject]
health education[Major Mesh]
health policy[Major Mesh]
health promotion[Major Mesh]
health services[Major Mesh]
health services accessibility[Major Mesh]
health services administration[Major Mesh]
health status[Major Mesh]
health status indicators[Focused CINAHL Subject]
hospitals rural[Focused CINAHL Subject]
morale[Major Mesh]
outcome assessment OR outcomes (health care)[Focused CINAHL Subjects]
patient admission[Major Mesh]
patient care[Focused CINAHL Subject]
productivity[Focused CINAHL Subject]
public health[Major Mesh]
quality of health care[Major Mesh]
quality of life[Major Mesh]
remote access to information[Focused CINAHL Subject]
rural areas OR rural health OR rural health centers OR rural health nursing OR rural health personnel OR rural health services[Focused CINAHL Subjects]
social isolation[Major Mesh]
socioeconomic factors[Mesh]
waiting lists[Major Mesh]

Search Terms Group B

decision making, computer-assisted[Major Mesh]
medical informatics[Major Mesh]
remote consultation AND (medicine or health)[Major Mesh]
satellite communications AND (medicine or health)[Major Mesh]
telecare[Text Word]
telecommunications AND (medicine or health)[Major Mesh & Text Words]
teleconferencing AND (medicine or health)[Focused CINAHL Subjects & Text Words]
teleconsult*[Text Word]
teledermatology[Text Word]
telefacsimile AND (medicine or health)[Major Mesh]
telehealth[Focused CINAHL Subject]
telemedicine[Major Mesh]
Telemetry[Major Mesh]
telenursing[Focused CINAHL Subject & Text Word]
telepathology [Major Mesh]
telephone AND (medicine or health)[Major Mesh]
teleradiology[Major Mesh]
television AND (medicine or health)[Major Mesh]

9. EconLit (Health economics and policy literature)

Publication Dates:1980 to present

In this economic database, telemedicine terms were not combined with any other search terms.

Search Terms

teleconsult*[EconLit Subject]
telelearning[EconLit Subject]
telematic*[EconLit Subject]
telemedical[EconLit Subject]
telemedicine[EconLit Subject]

10. Embase

Publication Dates:1988 to March 2002

Search Terms Group A

community care[Focused Embase Subject]
economic evaluation[Focused Embase Subject]
follow up[Focused Embase Subject]
health care access OR health care availability[Focused Embase Subjects]
health care cost OR health care delivery OR health care distribution OR health care financing OR health care policy OR health care quality OR health economics[Focused Embase Subjects]
health service[Focused Embase Subject]
health status[Focused Embase Subject]
hospital admission*[Focused Embase Subject]
hospital management[Focused Embase Subject]
income[Focused Embase Subject]
length of stay[Focused Embase Subject]
medical education[Focused Embase Subject]
paramedical education[Focused Embase Subject]
patient care[Focused Embase Subject]
poverty[Focused Embase Subject]
productivity[Focused Embase Subject]
quality of life[Focused Embase Subject]
resource allocation[Focused Embase Subject]
rural health care[Focused Embase Subject]
social aspect OR social isolation[Focused Embase Subjects]
socioeconomics[Focused Embase Subject]
travel[Focused Embase Subject]
treatment outcome[Focused Embase Subject]

Search Terms Group B

Computer assisted diagnosis[Focused Embase Subject]
telecommunications AND (medicine OR health service OR health care facilities and services OR health care facility OR health OR health care delivery OR technical and domestic health care assistance)[Focused Embase Subjects]
telecommunications AND (rural area OR rural health care OR rural population OR urban rural difference)[Focused Embase Subjects]
telecommunications AND (medical education OR consultation[Focused Embase Subjects]
Telemetry[Focused Embase Subject]

11. PsychInfo

Publication Dates: 1980 to March 2002

Search Terms Group A

community mental health[Focused PsychInfo Subject]
community mental health services[Focused PsychInfo Subject]
community services[Focused PsychInfo Subject]
cost*[Title Word]
counseling[Focused PsychInfo Subject]
decision making[Focused PsychInfo Subject]
geriatric assessment[Focused PsychInfo Subject]
health care delivery[Focused PsychInfo Subject]
health care policy[Focused PsychInfo Subject]
health care services[Focused PsychInfo Subject]
health care utilization[Focused PsychInfo Subject]
health personnel attitudes[Focused PsychInfo Subject]
health service needs[Focused PsychInfo Subject]
hospital admission*[Focused PsychInfo Subject]
hospitalization[Focused PsychInfo Subject]
Integrated services[Focused PsychInfo Subject]
long term care[Focused PsychInfo Subject]
medical education[Focused PsychInfo Subject]
medical students[Focused PsychInfo Subject]
mental health programs OR mental health services OR mental health[Focused PsychInfo Subjects]
morale[Focused PsychInfo Subject]
outreach programs[Focused PsychInfo Subject]
poverty[Focused PsychInfo Subject]
prenatal care[Focused PsychInfo Subject]
prevention[Focused PsychInfo Subject]
primary health care[Focused PsychInfo Subject]
professional consultation[Focused PsychInfo Subject]
psychological assessment[Focused PsychInfo Subject]
psychology educaton[Focused PsychInfo Subject]
psychotherapeutic outcomes[Focused PsychInfo Subject]
public health[Focused PsychInfo Subject]
quality of care[Focused PsychInfo Subject]
quality of life[Focused PsycInfo Subject]
quality of services[Focused PsychInfo Subject]
rehabilitation[Focused PsychInfo Subject]
remote[Title Word]
rural[Title Word]
rural environments[Focused PsychInfo Subject]
social discrimination OR social equality OR social integration[Focused PsychInfo Subjects]
social isolation[Focused PsychInfo Subject]
social services[Focused PsychInfo Subject]
socioeconomic status OR family socioeconomic level[Focused PsychInfo Subject]
treatment[Focused PsychInfo Subject]
treatment effectiveness evaluation[Focused PsychInfo Subject]
treatment outcomes[Focused PsychInfo Subject]

Search Terms Group B

remote AND (monitoring OR consultation) AND psychiatr*[Text Words]
satellite communications AND psychiatr*[[Text Words]
telecommunications AND psychiatr*)[Text Words]
telecommunications media AND (medical sciences OR psychiatry)[Focused PsychInfo Subjects]
teleconferenc* AND psychiatr*[Text Words]
teleconferencing AND (medical sciences OR psychiatry)[Focused PsychInfo Subjects]
Telemetry[Focused PsychInfo Subject]
television AND (medical sciences OR psychiatry)[Focused PsychInfo Subjects]
videoconferenc* AND psychiatr*[Text Words]

12. PAIS Public Affairs Information Service
Publication Dates: 1980 to March 2002

Search Terms Group A
community health services[PAIS Subject]
community mental health services[PAIS Subject]
health planning[PAIS Subject]
medical education[PAIS Subject]
medical service[PAIS Subject]
mental health OR mental health services[PAIS Subjects]
nursing education[PAIS Subject]
public health[PAIS Subject]

Search Terms Group B
telecommunications or teleconferencing[PAIS Subjects & Text Words] AND (medicine OR medical OR health)[Text Words]

13. Social Science Abstracts
Publication Dates: 1983 to April 2002

14. Sociological Abstracts
Publication Dates: 1980 to April 2002

In these social sciences databases, telemedicine terms were not combined with any other search terms

Search Terms
telecommunication[Subject]
telecommunication in medicine[Subject]
telecommunications OR telecommunications policy AND (medical OR medicine OR medical care OR health)[Subjects]
teleconferencing[Subject]
teleconsult*[Subject]
telelearning[Subject]
telematic*[Subjects]
telemedical[Subject]
telemedicine[Subject]

15. Telemedicine Information Exchange (TIE)
Publication Dates: to present

In this telemedicine database, only main search terms from Group A of the Main Search Terms were searched.

16. AARP Ageline
    Publication Dates: 1980 to December 2001
17. ABI Inform (Business and Management Database)
    Publication Dates: 1980 to present
18. ACP Journal Club (EBM Evidence Based Medicine Reviews)
    Publication Dates: 1991 to February 2002
19. Applied Science & Technology Index
    Publication Dates:1983 to March 2002
20. Cabot (Canadian Health Economics Research Association database)
    Publication Dates:1980 to present
21. Canadian Research Index
    Publication Dates:1982 to May 2002
22. Cochrane Controlled Trials Register
    Publication Dates: to present
23. Cochrane Database of Systematic Reviews
    Publication Dates: to present
24. INSPEC (Engineering and Telecommunications Database)
    Publication Dates:1990 to present
25. Papers First
    Publication Dates: 1993 to present
26. Proceedings First
    Publication Dates: 1993 to present
27. Proquest Digital Dissertations
    Publication Dates: 1980 to present
28. TRIP - Turning Research into Practice (Evidence based health literature)
    Publication Dates: to present
29. Web of Science (Science and social science Citation index)
    Publication Dates: 1995 to present
30. WorldCat (Joint catalogue of materials held by libraries worldwide)
    Publication Dates: 1980 to present

In databases numbered 16 through 30, search terms were taken exclusively from the Main Search Terms lists outlined above.

Refinements on Initial Database Search Results

From the initial search results and information gleaned from government reports on identified health care priorities in Alberta and Canada, it was decided to focus on these aspects of telehealth

1. Children
2. First Nations
3. Geriatric Homecare
4. Geriatric Mental Health
5. Geriatric Pharmacy
6. Home Care
7. Mental Health
8. Radiology
9. Renal Dialysis
10. Rural and Remote
11. Telerehabilitation
12. Ultrasound

Additional searching of existing results was done to locate subsets of the results in these particular areas. Lists of search terms used to identify these studies of particular interest to investigators follow:

NOTE: asterisks denote truncation of terms and/or geographic or other subheadings attached.

Children
child* OR infant* OR pediatric* OR paediatric* OR telepediatric* OR telepaediatric* OR adolescent* OR youth* OR baby OR babies OR newborn* OR teen*[Text Words] OR children* OR child care OR child health OR child health care OR child health services OR child nutrition OR child psychiatry OR child,hospitalized OR child,preschool OR childhood OR childhood disease OR infant OR infant care OR infant,newborn* OR infant,premature OR adolescence OR adolescent OR adolescent health services OR adolescent psychiatry OR pediatric care OR pediatric hospital OR pediatric nursing OR pediatrician OR pediatrics* OR

First Nations
(first AND nation*) OR inuit* OR eskimo* OR dene* OR native* OR indigenous OR aboriginal* OR aborigin* OR metis OR lapis OR Indian*[Text Words] OR native peoples* OR health services,indigenous OR indians,north american OR eskimos OR aborigines[Keywords/Subject Words]

Geriatric Homecare

geriatric* OR senior* OR elder* OR older OR gerontolog* aged OR aging OR telegeriatric*[Text Words] OR geriatric assessment OR geriatric* OR gerontology* OR geriatric care OR geriatric disorder OR geriatric nursing OR geriatric nutrition OR geriatric patient OR geriatric psychiatry OR gerontologic care OR gerontological nursing OR gerontospychiatry OR telegeriatric* OR old age-care and treatment OR old OR old age-home care OR old age-medical care OR older adults* OR older adults-treatment compliance OR aged OR aged-medical care OR aged-long term care OR aged,80 and over OR aging OR elderly OR elderly care OR elderly patients.

AND

home* OR telehome* OR tele-home* OR monitor* OR distance[Text Words] OR home OR home-care OR home health care* OR home nursing* OR home care agencies OR home care equipment and supplies OR home care services* OR home dialysis OR home fetal monitoring OR home health agencies OR home health care OR OR home monitoring OR home rehabilitation OR home visits OR homebound patients OR homebound persons OR aged-home care OR alarm monitoring OR monitoring* OR monitor OR self help devices OR self administration OR self care OR self evaluation OR self help OR self medication OR aged-home care [Keywords/Subject Words]

Geriatric Mental Health

geriatric* OR senior* OR elder* OR older OR gerontolog* aged OR aging OR telegeriatric*[Text Words] OR geriatric assessment OR geriatric* OR gerontology* OR geriatric care OR geriatric disorder OR geriatric nursing OR geriatric nutrition OR geriatric patient OR geriatric psychiatry OR gerontologic care OR gerontological nursing OR gerontospychiatry OR telegeriatric* OR old age-care and treatment OR old OR old age-home care OR old age-medical care OR older adults* OR older adults-treatment compliance OR aged OR aged-medical care OR aged-long term care OR aged,80 and over OR aging OR elderly OR elderly care OR elderly patients.

AND

mental* OR teletherap* OR psychiatr* OR telepsychiatr* OR psycholog* OR telepsycholog*[Text Words] OR mental health services* OR mental competency* OR mental disease* OR mental disorders* OR mental health* OR mental health care OR mental health center OR mental health service* OR mental patient OR mental stress OR mentally-ill care OR older adults,mental health services OR psychiatric care OR psychiatric diagnosis OR psychiatric hospitals OR psychiatric nursing OR psychiatric patients* OR psychiatric residents OR psychiatric* OR psychiatric telemedicine* OR psychiatric treatment OR psychiatrist OR psychiatry OR psychodiagnosis* OR psychological assessment OR psychological tests OR psychology OR psychology,clinical OR telepsychiatry OR teletherapy[Keywords/Subject Words]

Geriatric Pharmacy
geriatric* OR senior* OR elder* OR older OR gerontolog* aged OR aging OR telegeriatric*[Text Words] OR geriatric assessment OR geriatric* OR gerontology* OR geriatric care OR geriatric disorder OR geriatric nursing OR geriatric nutrition OR geriatric patient OR geriatric psychiatry OR gerontologic care OR gerontological nursing OR gerontospychiatry OR telegeriatric* OR old age-care and treatment OR old OR old age-home care OR old age-medical care OR older adults* OR older adults-treatment compliance OR aged OR aged-medical care OR aged-long term care OR aged,80 and over OR aging OR elderly OR elderly care OR elderly patients OR older adults-treatment compliance

AND

pharmacy OR pharmaceutical* OR medication* OR drug* OR prescription* OR telepharmac*[Text Words] OR pharmaceutical care OR pharmaceutical preparations OR pharmaceutics OR pharmacies OR pharmacists OR pharmacoeconomics OR pharmacology OR pharmacy OR drug therapy* OR drug administration* OR drug administration schedule OR drug combination OR drug comparison OR drug cost* OR drug dose OR drug effect* OR drug efficacy OR drug information OR drug information services OR drug interactions OR drug marketing OR drug monitoring OR drug resistance,microbial OR drug therapy OR drug therapy,computer assisted OR drug use OR drugs OR drugs-long term care OR self medication OR medication compliance OR prescription OR prescription,drug[Keywords/Subject Words]

Home Care
home* OR telehome* OR tele-home* OR monitor* OR distance[Text Words] OR home OR home-care OR home health care* OR home nursing* OR home care agencies OR home care equipment and supplies OR home care services* OR home dialysis OR home fetal monitoring OR home health agencies OR home health care OR home monitoring OR home rehabilitation OR home visits OR homebound patients OR homebound persons OR aged-home care OR alarm monitoring OR monitoring* OR monitor OR self help devices OR self administration OR self care OR self evaluation OR self help OR self medication OR aged-home care [Keywords/Subject Words]

Mental Health
mental* OR teletherap* OR psychiatr* OR telepsychiatr* OR psycholog* OR telepsycholog*[Text Words] OR mental health services* OR mental competency* OR mental disease* OR mental disorders* OR mental health* OR mental health care OR mental health center OR mental health service* OR mental patient OR mental stress OR mentally-ill care OR older adults,mental health services OR psychiatric care OR psychiatric diagnosis OR psychiatric hospitals OR psychiatric nursing OR psychiatric patients* OR psychiatric residents OR psychiatric* OR psychiatric telemedicine* OR psychiatric treatment OR psychiatrist OR psychiatry OR psychodiagnosis* OR psychological assessment OR psychological tests OR psychology OR psychology,clinical OR telepsychiatry OR teletherapy[Keywords/Subject Words]

Radiology
radiolog* OR teleradiolog* OR radiotherapy*[Text Words] OR radiographs OR radiologists OR radiology OR radiology practice OR radiology service OR radiotherapy* OR teleradiology OR radiography OR radiography,dental* OR radiography,thoracic[Keywords/Subject Words]

Renal Dialysis
dialysis OR dialyzer OR teledialysis OR hemodialysis OR haemodialysis[Text Words] OR hemodialysis OR hemodialysis,home OR hemodialysis units, hospital OR renal dialysis OR teledialysis* OR peritoneal dialysis* OR kidney failure OR kidney failure,chronic[Keywords/Subject Words]

Rural and Remote
rural* OR remote* OR underserve* OR inaccessible OR isolate* OR distance*[Text Words] OR rural OR rural health services* OR rural population health OR rural area* OR rural elderly with cancer OR rural environments OR rural health* OR rural health care OR rural health nursing OR rural mental health services* OR rural physicians OR rural telepsychiatry OR rural population OR remote OR remote access to information OR remote consultation* OR remote facilitation* OR distance technology & mental health counseling OR social isolation OR isolated health care professionals* OR isolation OR medical service-rural Canada OR medical service-rural United States

Telerehabilitation
rehab* OR telerehab* OR recover*[Text Words] OR recovery OR rehabilitation OR rehabilitation center* OR rehabilitation medicine OR rehabilitation nursing OR rehabilitation, cardiac OR rehabilitation, pediatric OR rehabilitation, vocational OR rehabilitation, personal-care[KeyWords/Subject Words]

Ultrasound
ultrasound* OR ultrasonograph* OR teleultrasound* OR teleultrasonograph*[Text Words] OR ultrasonography OR ultrasonography,Doppler* OR ultrasonography,prenatal OR ultrasound[Keywords/Subject Words]

Hand Searching

The following journals were hand-searched 1997 to the present:

1. Healthcare Information Management & Communications Canada (COACH journal)
2. Journal of Telemedicine & Telecare
3. Journal of the American Medical Informatics Association
4. Online Journal of Nursing Informatics
5. Telemedicine Journal
6. Telemedicine Journal & E-Health
7. Telemedicine Today

The following conference proceedings were hand-searched:

1. American Telemedicine Association Conference (1998 to present)
2. Canadian Society for Telehealth Conference (1999 to present)
3. Canadian Organization for Advancement of Computers in Health Conference (1998 to present)
4. International Conference on Successes and Failures in Telehealth (2000 to present)

Investigators examined bibliography lists from relevant articles retrieved in the course of database and hand searching to broaden the scope of the search and consulted with colleagues in an effort to ensure that all relevant studies were identified.

Internet Searching

The Internet was searched using the Google (www.google.com) and Copernic (www.copernic.com) search engines and using the Main Search Terms outlined above in the database searching section of this document.

In addition to free-text searching of the Internet using two search engines, specific organization and government web sites were targeted and searched for evidence of articles, reports, news releases and project announcements relevant to this research topic.

The lists of organization and government web sites searched follows:

Canadian Organization Web Sites

1. Agence d'Evaluation des Technologies et des Modes d'Intervention en Sante (AETMS)
2. Alberta Heritage Foundation for Medical Research
3. Alberta Regional Health Authorities
4. Alberta we//net
5. British Columbia Office of Health Technology Assessment
6. CANARIE
7. Canadian Coordinating Office for Health Technology Assessment
8. COACH Canadian Health Informatics Association
9. Canadian Health Services Research Foundation
10. Canadian Institute for Advanced Research
11. Canadian Institute for Health Information
12. Canadian Institutes of Health Research
13. Canadian Policy Research Networks
14. C.D. Howe Institute
15. Canadian Policy Research Networks
16. Canadian Provinical/Territorial Ministries of Health
17. Canadian Society of Telehealth
18. Centre for Advancement of Health
19. Centre for Health Economics and Policy Analysis
20. Centre for Health Services & Policy Research (Queens University)
21. Centre for Health Services & Policy Research (UBC)
22. The Centre for Rural and Northern Health Research (Laurentian University)
23. The Centre for Rural and Northern Health Research (Lakehead University)
24. Fraser Institute
25. Health Canada
26. Health Canada. First Nations and Inuit Health Branch
27. Health Canada Office of Rural Health
28. Health Services Utilization and Research Commission
29. Industry Canada
30. Institute for Clinical and Evaluative Sciences
31. Institute of Health Economics
32. Manitoba Centre for Health Policy
33. Newfoundland and Labrador Centre for Applied Health Research
34. Office of Health and the Information Highway
35. Ontario Institute for Studies in Education (OISE)
36. Population Health Research Unit
37. University of Laval E-Watch Bulletin & database on knowledge utilization

International Organization Web Sites

1. Australian Efficacy Register of New Interventional Procedures
2. Centre for Clinical Effectiveness (AU)
3. Blue Cross/Blue Shield Association Technology Evaluation Centre (U.S.)
4. Catalan Agency for Health Technology Assessment
5. Centre for Health Economics, University of York (UK)
6. Centre for Health Economics Research and Evaluation (AU)
7. Centre for Health Program Evaluation (AU)
8. Centre for Reviews and Dissemination, University of York (UK)
9. European Health Telematics Association
10. Finnish Office for Health Technology Assessment
11. Health Economics Research Unit – HERU (UK)
12. Health Informatics WorldWide
13. Health Technology Assessment Agency (Spain)
14. International Department of Health Web Sites
15. International Network of Agencies for Health Technology Assessment
16. International Society for Technology Assessment in Health Care
17. Leonard Davis Institute of Health Economics (U.S.)
18. National Bureau of Economic Research
19. National Electronic Library for Health Informatics (UK)
20. New York Academy of Medicine Grey Literature Report
21. New Zealand Health Technology Assessment Clearinghouse for Health Outcomes and Health Technology Assessment (NZTA)
22. Queensland Telemedicine Network (AU)
23. RAND Organization
24. Swedish Council on Technology Assessment in Health Care
25. U.S. Agency for Healthcare Research and Quality
26. U.S. General Accounting Office - GAO
27. UK National Coordinating Centre for Health Technology Assessment (NCCHTA)
28. UK National Institute for Clinical Excellence (NICE)
29. UK National Research Register
30. U.S. Office for the Advancement of Telehealth
31. U.S. Congress Office of Technology Assessment
32. World Bank
33. World Health Organization

APPENDIX C

Policy Working Group Contacts

Advisory Committee on Health Infostructure Members

- Donna Brewer, Assistant Deputy Minister, Support Services Branch, Department of Health and Community Services, Newfoundland
- Mike Connolly, Chief Executive Lead, Smart Systems for Health, Ministry of Health and Long-Term Care, Ontario
- David Cowperthwaite, Director of Information Systems, Department of Health and Wellness, New Brunswick
- Mireille Fillion, Sous-ministre adjointe, Direction generale de la planification strategique et de l'evaluation, Ministere de la sante et des services sociaux, Quebec
- Neil Gardner, Executive Director, Corporate Information & Technology, Saskatchewan Health
- Kees Hamming, Chief Information Officer, Department of Health and Social Services, Government of Northwest Territories
- Joy Kajiwara, Senior Health Services Advisor, Department of Health and Social Services, Yukon Government
- Sarah Kramer, Chief Information Officer, Nova Scotia Department of Health
- Linda Lizotte-MacPherson, President & CEO, Canadian Health Infoway Inc. (CHII)
- Ken Mason, A/Executive Director, Information Systems, Manitoba Health
- Herman McQuaid, Director of Health Informatics, PEI Department of Health and Social Services
- John Mullin, Head, Health Care Programs Development and Support, Minstry of Health and Long-Term Care, Ontario
- Dr. Tom Noseworthy, Intensive Care Physician; Information Communications Technology (ICT) and Policy Researcher, Department of Community Health Sciences, University of Calgary
- Marcel Nouvet, Assistant Deputy Minister, Information, Analysis and Connectivity Branch, Health Canada
- Richard O'Brien, Assistant Deputy Minister, Corporate Services and Strategic Initiatives, Department of Health and Social Services, Government of Nunavut
- Bruce Petrie, Vice President and Chief Operating Officer, Canadian Institute for Health Information
- Dr. Carl Robbins, Chair, Electronic Record Working Group, Advisory Committee on Health Information

- John Schinbein, Chief Information Officer, BC Ministry of Health Services & Health Planning
- Linda St-Amour, Projects Manager, Advisory Committee on Health Infostructure, Health Canada
- Alex Stewart, Assistant Deputy Minister/CIO, Information Management, Alberta Health and Wellness; delegated to: Elaine Stakiw (see Alberta Policy and Decision Makers)
- Michael Wolfson, Assistant Chief Statistician, Analysis and Development Field, Statistics Canada

Alberta Policy and Decision Makers

- Dr. Pierre Beausejour, Chair, Provincial Telehealth Committee, Alberta
- Dr. Al Cook, Dean, Faculty of Rehabilitation, University of Alberta
- Shelley Ewart-Johnson, Deputy Minister, Alberta Health and Wellness
- Marty Landrie, Aboriginal Mental Health, Adult Services Coordinator, Alberta Mental Health Board
- Wayne McKendrick, Sr. Policy Advisor to the Minister of Health
- Linda Miller, Alberta representative on Federal/Provincial/Territorial Committee
- Larry Ohlhauser, M.D., Chair, Implementation Committee Mazankowski Report
- Dr. O'Dell Olson, Chair, Coordinating Committee, Rural Physicians Action Plan
- Elaine Stakiw, Director, Research & Evidence Branch, Alberta Health & Wellness
- Sharlene Stayberg, Telehealth Director, Alberta Wellnet
- Brenda Waye Perry, Program Manager, Alberta Health and Wellness

Federal Policy and Decision Makers

- Catherine Adam, Director Strategic Policy, First Nations and Inuit Health Branch, Health Canada
- Wayne Bell, Chair – Policy Committee, The Canadian Society of Telehealth
- Anthony Chu, Director, CHIPP, Information Analysis & Connectivity Branch, Health Canada
- Ernie Dal Grande, Telehealth Program Manager, First Nations and Inuit Health Branch, Health Canada
- Dr. Rene Dion, Senior Evaluation Manager, First Nations and Inuit Health Branch, Health Canada

- Judith Dowler, Director, Health Information and Analysis, First Nations and Inuit Health Branch, Health Canada
- Dr. Bob Filler, President, The Canadian Society of Telehealth
- Rafiq Khan, Senior Director, Strategic Development, CANARIE
- Esther Kwavnick, A/Director, Rural Health Program, Population and Public Health Branch, Health Canada
- Dr. Charles Mallory, Director, Health Supply and Demand Analysis, Information, Analysis and Connectivity Branch, Health Canada
- Bill Pascal, Past Director General, Office of Health and the Information Highway
- Marie Williams, Director General, Office of Health and the Information Highway

APPENDIX D

Abbreviations and Definitions used in the Critique of Articles

Abbreviations

A&E: Acute and Emergency
AHFMR: Alberta Heritage Foundation for Medical Research
CBA: Cost-Benefit Analysis
CE: Cost effectiveness
CME: Continuing Medical Education
Dx/dx: diagnostic
FTF/ftf: Face-to-face
F/u: Follow-up care
Fx: Function(ing)
H: Hospital
HCD: Health Care Delivery
ICT: Information and Computer Technology
IT: Information Technologies
Mgm: management
PCP: Primary Care Physician
POTS: Plain Old Telephone System
RCT: Randomized Controlled Trial
SoE: Strength of Evidence
S/F: Store and Forward Technology
SS: Satisfaction Survey
Tel: Telephone
TC: Telecommunications
TH: Telehealth
TM: Telemedicine
TR: Teleradiology
Tx/tx: Treatment
V/C v/c: Videoconferencing

Definitions:

Efficacy: The efficacy of a telemedicine application is its performance, after an initial learning period for users, under carefully applied and monitored protocols, such as those in pilot projects.

Effectiveness: Effectiveness relates to how well the technique will perform after it has been adopted for routine use. Determination of effectiveness requires longer-term follow-up and appraisal.

(Hailey, Roine, and Ohinmaa, JTT, 2002. 8 (Suppl.1): S1:1)

APPENDIX E: CRITIQUE PEDIATRICS

Author / Title / Journal / Year / Country / Location	Purpose/ Objectives	Design	Analysis	Participants: age/ gender/ groups	Intervention/ Duration	Follow-up: sample size; dropout	Outcomes/ Socio-Economic Indicators	Methodological Problems
Barber JW, King WD, Monroe KW, Nichols MH. Evaluation of emergency department referrals by telephone triage. Pediatrics 2000; 105(4 I):819-821. **USA** Birmingham, Children's H	to examine the appropriateness of referrals to a pediatric emergency department by the Pediatric Health Information Line (PHIL), a hospital-based telephone triage program, versus all other sources of referrals.	Blinded Delphi study, comparison of referrals that used PHIL with randomly selected sample of other referrals	Comparison of appropriateness of referral between two groups using chi-square test, calculated OR + CI	Intervention group n =133, control n = 260. Substantial difference in racial composition and insurance status between two groups [whites 68.45 v 33.5%; private insurance 80% v 38%]	Use of telephone triage system	N/A – only admissions considered	The PHIL group had an appropriateness rate of 80.2%, compared with 60.5% for the control group [chi2 = 14.6369; OR 2.65; CI 1. 58-4.50]). Insurance status shown as a confounder, in PHIL group 84.9% of insured group appropriately referred v 68.4% for uninsured	Substantial differences between study groups. Some judgments of appropriateness said to be selective. 10% of PHIL group did not accept triage recommendation, were excluded from study.

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Battles HB and Wiener LS. Starbright World: Effects of an electronic network on the social environment of children with life-threatening illnesses. Children's Health Care March 1, 31[1], 47-68. 2002. **USA** Bethesda	To test the hypothesis that an interactive on line communication technology provides benefits to patients receiving outpatient treatment for serious illnesses	prospective comparative study, with random assignment to the first of eight sessions	ANOVA; use of State Anger Inventory, Faces Pain Scale, Anxiety Analogue Scale, Depression and Exhaustion Analogue Scales, University of California loneliness scale, Child behaviour Checklist and interviews with children, parents and staff.	32 children who were participating in clinical trials at the national Institutes of Health, 78% HIV – infected, remainder with other life threatening conditions.	Use of STARBRIGHT World (SBW), an interactive computer network for health education and communication. The comparison was participation in traditional hospital recreational activities (playroom). Each participant had fours sessions each of the intervention and the playroom.	All participants completed 8 sessions, during visits to the hospital. For most there were no more than two sessions per visit.	Children reported significantly less loneliness and were significantly more willing to return to hospital for treatment from baseline to follow up. They were marginally less worried after using SBW than after using the playroom. Parents reported their children experienced less withdrawn behaviour and needed less help with anxiety ad resistance in returning to hospital for treatment after using SBW. The also reported that SBW helped their children feel decreases in loneliness and depressed mood and increases inenergetic mood.	Authors note that an experimental design was not possible for measurement and some f the attributes of interest. Also, use of a health control group was not feasible or appropriate.

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Bynum A, Hopkins D, Thomas A, Copeland N, Irwin C. The effect of telepharmacy counseling on metered-dose inhaler technique among adolescents with asthma in rural Arkansas. Telemed J E Health 2001; 7(3):207-217. **USA** Arkansas, rural clinics	To examine effect of telepharmacy counseling, using interactive compressed video, on metered-dose inhaler (MDI) technique and patient satisfaction among adolescents with asthma.	Small sample RCT (III) (N<30) SoE: Good-Fair	ANOVA, chi –square, t test	Adolescents with asthma, telepharmacy counseling group (n = 15) and control group (n = 21, from n=49 who elected to participate.	Counseling by pharmacists that included verbal instructions and demonstrations. Control group provided with written instructions. Both groups assessed by interactive video.	Both groups participated in pre-test, post-test, and 2- to 4-week follow-up assessments for MDI technique and patient satisfaction (follow-up assessment only) via interactive compressed video.	Telepharmacy counseling group showed more improvement in MDI technique than participants in the control group ($p < 0.001$). NSD in satisfaction with the instructional sessions ($p = 0.132$). Both groups had high levels of satisfaction with the telepharmacy sessions.	

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Dick PT, Filler R, Pavan A. Participant satisfaction and comfort with multidisciplinary pediatric telemedicine consultations. J Pediatr Surg 1999; 34(1):137-141. **Canada** Toronto, Children's H	To measure both satisfaction and comfort levels and estimates of cost savings of families with children receiving health care services from a distant pediatric tertiary care center by readily available telecommunications technologies.	Survey of families, using Likert scales.		140 children at a site 840 miles from the tertiary care center	Teleconsultation from tertiary centre		Estimated average savings of $1,318 per family (S.D. $677).	Self reported estimates as basis for cost information. Data from 98 of 140 those who had a telemedicine encounter.
Dini EF, Linkins RW, Chaney M. Effectiveness of computer-generated telephone messages in increasing clinic visits. Archives of Pediatrics & Adolescent Medicine 1995; 149(8):902-905. **USA** Georgia, public health clinics	To evaluate the effectiveness of computer-generated telephone reminder calls in increasing kept appointment rates in a public health setting;	RCT (II) SoE: Good randomization based on first letter of last name		N=517 clients with scheduled appointments during a 4-week period at immunization, women, infant, and children; well- child; or family-planning programs. N= 277 intervention. N=240 controls	A single computer-generated telephone reminder 1 day before each client's scheduled appointment	N/A – comparison of attendance at clinic	Of the 7 clients assigned to receive the intervention, 52% kept their appointments, compared with 32.5% of controls (P<0.05). Improvement in kept appointment rates associated with receiving the message was highest for the immunization-program (183% increase, P<0.05), with increases of 64%, 53%, and 44% for the well-child; women, infant, and children, and family-planning programs, respectively.	

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Finley JP, Sharratt GP, Nanton MA, et al. Paediatric echocardiography by telemedicine - nine years' experience. Journal of Telemedicine and Telecare 1997;3:200-204. **Canada** Nova Scotia	To evaluate the effect of echocardiogram transmission on image quality, diagnostic completeness, diagnosis and patient transfer and to determine the costs associated with the telemedicine network.	Case-control study and non-controlled, prospective clinical series. Cost of telemedicine network compared with cost of transport for conventional consultation.		Children requiring cardiac care	Neonatal echocardiograms and those from older children were transmitted for interpretation by pediatric cardiologists. Transmitted studies were compared with repeat in-person studies in 26 cases Over two years, 135 studies were transmitted from six regional hospitals to a tertiary-care hospital in Halifax		The cost of the network during the two-year study period was $CAN 90,000. The cost of transportation avoided was $CAN100,000-118,000. A comparison of 26 transmitted studies showed no important discrepancies with repeat, 'in person' studies. Use of telemedicine saved unnecessary patient transfer in 31 cases.	There are only brief details of cost estimates, which do not include lost earnings for parents.

APPENDIX E: CRITIQUE PEDIATRICS

Author / Title / Journal / Year / Country / Location	**Purpose/ Objectives**	**Design**	**Analysis**	**Participants: age/ gender/ groups**	**Intervention/ Duration**	**Follow-up: sample size; dropout**	**Outcomes/ Socio-Economic Indicators**	**Methodological Problems**
Gray JE, Safran C, Davis RB, Pompilio-Weitzner G, Stewart JE, Zaccagnini L et al. Baby CareLink: using the internet and telemedicine to improve care for high-risk infants. Pediatrics 2000; 106(6):1318-1324. **USA** Boston, Medical Center	To evaluate an Internet-based telemedicine program designed to reduce the costs of care, to provide enhanced medical, informational, and emotional support to families of very low birth weight (VLBW) infants during and after their neonatal intensive care unit (NICU) stay.	RCT in a cohort of VLBW infants born between November 1997 and April 1999. Birth weight –stratified permuted block design. randomized within 10 days of birth	Family perceptions measured using Picker institute's NICU family satisfaction survey, administered after discharge. Simple comparisons with chi squared or Wilcoxon rank sum tests	Families of VLBW infants whose stay in the NICU was expected to be > 14d. Of n=176 VLBW admitted during the study period, 88 were eligible for randomization and of these n=26 randomized to intervention and n= 30 to control.	Videoconferencing module that allowed virtual visits and distance learning from a family's home during an infant's hospitalization; installed in home within 3 weeks of birth	Surveys administered to n=51 families, others not surveyed because of death, n=1, or transfer to other facility, n=4.	Intervention group reported higher overall quality of care, significantly fewer problems with the overall quality of care received by their family (mean problem score: 3% vs 13%) and greater satisfaction with the unit's physical environment and visitation policies (mean problem score: 13% vs 50%). The duration of hospitalization until ultimate discharge home was similar in the 2 groups (68.5 +/- 28.3 vs 70.6 +/- 35.6 days). Among infants born weighing <1000 g (n = 31) there was a tendency toward shorter lengths of stay (77.4 +/- 26.2 vs 93.1 +/- 35.6 days) in intervention group. All infants in intervention group discharged directly to home, 6/30 (20%) of control infants were transferred to community hospitals before ultimate discharge home.	Size of intervention group at follow up not entirely clear – results suggest n=21. Reference is made in conclusions to the intervention lowering costs, though no data are presented.

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Kallis JM, Gonzalez Del Rey JA, Ruddy RM, Schubert CJ. Linking emergency department patients to primary care: Phone vs face-to-face interaction. Academic Emergency Medicine 1999; 6(8):817-822. **USA** Cincinnati, Children's H	To compare the patient compliances and time analyses of two methods of assigning primary care providers (PCPs) to ED patients who are without a PCP: phone interview vs face-to-face interaction.	Prospective observational cohort study		455 of 1,062 consecutive patients evaluated in the ED and without a PCP. Contact was made by phone for 151 (33%) patients and face-to-face for 304 (67%).	Contact by telephone - Patients enrolled were addressed by a nurse practitioner/social worker who arranged an appointment with a PCP, either in person (in ED) or by phone after discharge		Sixty-two percent of the phone patients kept their appointments, compared with 52% of face-to-face patients ($p = 0.048$, $RR = 1.20$, $1.02 < RR < 1.41$). Phone interaction was also more time effective – face to face contact required >2.5 times person hours per patient. If non productive time waiting for patients to come to ED was included, face to face interaction time was 22 times that of the telephone group.	Time analysis was conducted over a two month period during the 12 months of the study and no details of the results are given, other than summary information. The claim of a 22 – fold increase in time because of non-productive activities does not seem credible.

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Kempe A, Dempsey C, Hegarty T, Frei N, Chandramouli V, Poole SR. Reducing after-hours referrals by an after-hours call center with second-level physician triage. Pediatrics 2000; 106(1 II):226-230. **USA** Denver Children's H	One-third of practices signing-out to The Children's Hospital Call Center in Denver, Colorado, choose to do triage for calls judged by the Center to require (AHR). To examine 1) the effect of second-level physician (SLP) triage on the rate of after-hours referral (AHR) from practices to the hospital and 2) reasons for physicians' decisions.	Analysis of administrative data, survey of triaging physicians			Use of nurses to decide disposition of calls, on call physician for triage where judged necessary		There were 955 eligible calls, 22% (N = 216) of which were initially given an urgent disposition by Call Center nurses. Physician questionnaires were completed for 97% (N = 209). Of patients initially triaged for AHR, 49% (N = 103) were subsequently given an AHR, 17% (N = 35) a next day office referral, and 34% (N = 71) home care and advice. Reasons for not urgently referring included the following: 1) medical problem didn't require urgent evaluation (95%, N = 99); 2) change in the patient's condition; (40% N = 43); 3) prior knowledge of family's ability to evaluate and care for the patient (40%, N = 43); and 4) knowledge of the patient's medical history (18%, N = 19). After SLP triage the overall urgent referral rate was 11%, compared to 22% at the start of the study.	

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Lieu TA, Capra AM, Makol J, Black SB, Shinefield HR. Effectiveness and cost-effectiveness of letters, automated telephone messages, or both for underimmunized children in a health maintenance organization. Pediatrics 1998; 101(4):E3. **USA**	To evaluate the effectiveness and cost-effectiveness of sending letters, automated telephone messages, or both to families of under-immunized 20-month-olds in a HMO.	RCT (II)	Decision analysis to evaluate the projected cost-effectiveness of the alternative strategies, no details available	648 under-immunized 20-month-olds were randomized. No further details	Assigned to one of: 1) an automated telephone message alone; 2) a letter alone; 3) an automated telephone message followed by a letter 1 week later; 4) a letter followed by an automated telephone message 1 week later.	To 24 months of age, no details	The primary outcome was receipt of any needed immunization by 24 months of age. A letter followed by a telephone message (58% immunized) was significantly better than either a letter alone (44% immunized) or a telephone message alone (44%). A telephone message followed by a letter (53% immunized) also was more effective than either alone, although the differences were not statistically significant. Among a similar comparison group that received no systematic intervention, 36% were immunized. The estimated cost per child immunized was $7.00 using letters followed by automated telephone messages, $9.80 using automated telephone messages alone, and $10.50 using letters alone. Under alternative cost assumptions for automated telephone messages and mailed messages, the cost per child immunized ranged from $2.20 to $6.50.	Insufficient detail to comment

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McLario DJ, Simon HK, Sullivan KM, Parmer EM. Impact of changes in the Fever protocol on a nursing directed after-hours pediatric telephone advice service ... including commentary by McIntyre J. Ambulatory Child Health 1998; 3(4):365-371. **USA** Atlanta	to compare the effect of 'at home' observation versus immediate physician evaluation of young children with fever, based on standardized advice line protocols.	Retrospective descriptive patient series	Mann- Whitney U test for assessment of intergroup differences	Patients 3-36 months of age for whom a standardized fever protocol was utilized.,, n=111 consecutive patients from 1994 and n=108 from 1995.	Nurse – directed telephone service – In 1995, the protocol was modified to provide nurses with the option of delay in referral for on-site evaluation for up to 16 h if patients are described via telephone as appearing generally well.	Periodic surveys of community physicians, timing not clear	The telephone service handles up to 20,000 telephone calls each month, of which 20% were devoted to concerns regarding fever. Referral rate for immediate evaluation decreased from 39.6% to 15.7% for all children triaged using the Fever protocol. No adverse events were noted as a result of the change in the Fever protocol. Referral rate for immediate evaluation for all protocols declined from 18.4% in 11/1994 to 13.9% in 12/1995	details of follow up surveys not given

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Mehta AR, Wakefield DS, Kienzle MG, Scholz TD. Pediatric tele-echocardiography: evaluation of transmission modalities. Telemed J E Health 2001; 7(1):17-25. **USA** Iowa City and remote sites	To examine the effectiveness of tele-echocardiography connections and the satisfaction of the referring physicians using these services	Comparison of usage data and surveys of physicians	ANOVA, F-test for comparison of modes of transmission	112 pediatric patients	transmission of echocardiography data		The time interval between performing an echocardiogram and receiving the study was significantly longer for echocardiograms sent from the 170-mile courier site (2474 +/- 295 min) than either the 25-mile courier site (474 +/- 151 min), DS3 (374 +/- 121 min), or ISDN-PRI (129 +/- 16 min). Corresponding times between acquiring the ECG and verbal communication of results to the referring physician were 2,699 min, 1,253 min and 191 min.	

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Mulholland HC, Casey F, Brown D, Corrigan N, Quinn M, McCord B et al. Application of a low cost telemedicine link to the diagnosis of neonatal congenital heart defects by remote consultation. Heart 1999; 82(2):217-221. **UK** Belfast and Londonderry, Children's H and General H	To determine whether accurate remote echocardiographic diagnosis of congenital heart disease could be achieved using a low cost telemedicine system	case series with cost estimates		63 children suspected of having congenital heart disease	tele echocardiography		Over two years of the study, transfer of babies to obtain diagnosis was avoided in 74% of cases (47 ambulance transfers avoided). Equipment rental and telephone charges totalled $US10,400 while estimated savings to the hospital were $US 22,560 ($US480 per transfer).	Cost estimates are indicative, do not include staff –related costs of telemedicine and assume that all transfers would in fact have been by ambulance.

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Rendina MC, Bose CL, Gallaher KJ, Long WA, Ciszek TA, Baush CM et al. The effect of a neonatal telecardiology system on respiratory therapy in very low birthweight infants. Medinfo 1998; 9 Pt 1:298-301. **USA** NICU at Fayetteville, North Carolina	To determine whether a more rapid turn-around of echocardiographic interpretations and availability of interactive video reduces morbidity of very low birthweight infants.	Retrospective comparison of cohorts		21 very low birthweight infants in the pre telemedicine group and 28 in the telemedicine group; groups were similar on the basis of known risk factors	Use of a telecardiology system for transmission of echocardiograms for expert interpretation.		A composite index of respiratory therapy intensivity and duration was similar in both groups. The results do not demonstrate reduction in respiratory therapy utilization due to telemedicine (89.6 +/- 12.6 before versus 89.5 +/- 13.0 with telemedicine).	Data for both study and control groups were obtained retrospectively. Small numbers of subjects. Objective was to measure whether there was a reduction in morbidity associated with telemedicine, though some of the discussion refers to resource allocation.

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Rendina MC, Carrasco N, Wood B, Cameron A, Bose C. A logit model for the effect of telecardiology on acute newborn transfers. Int J Technol Assess Health Care 2001; 17(2):244-249. **USA** NC	To investigate the effect of immediate echocardiogram interpretation via telemedicine on rates of neonatal transfer to academic medical centers	Quasi – experimental, retrospective comparison	A logit model was developed to predict the probability of transfer from two regional level 3 neonatal intensive care units to academic medical centers. One of these units implemented a telecardiology program and the other acted as a comparison institution with on-site cardiology expertise	Infants (n = 2,142) admitted to neonatal intensive care at either of the two institutions	telecardiology, began 18 months into the 36-month study period		A statistically significant reduction in the rate of transfer to academic medical centers was observed. Telecardiology was associated with a 58% reduction of such transfers, from 12.3% to 5.7% (p = .001, 95% CI = 30%, 75%). No such reduction was noted at the comparison institution. It is estimated that approximately 30 transfers were eliminated during the study period, resulting in the elimination of approximately $150,000 in hospital charges. In addition, the infants that were transferred after the adoption of telemedicine were more often transferred to their telemedicine partner institution (p < .02)	

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Rendina MC, Downs SM, Carasco N, et al.. Effect of telemedicine on health outcomes in 87 infants requiring neonatal intensive care. Telemedicine Journal 1998;4:345-351. **USA** NICU at New Hanover, NC	To assess whether utilization of telemedicine reduces the intensive care length of stay (LOS) of low birthweight infants.			48 infants in the telemedicine group and 39 infants in the historical control group.	Transmission of neonatal echocardiograms for rapid interpretation.		The capital start-up costs and fixed line charges increased the cost per echocardiogram by $33 compared to the overnight courier service. There was a statistically non-significant reduction of 5.4 days in the intensive care LOS in the telemedicine group.	Data for both study and control groups obtained retrospectively. Relatively small numbers of subjects. LOS in the NICU has limitations as an outcome measure. Cost estimates do not include personnel-related items.

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Rendina MC, Long WA, deBliek R. Effect size and experimental power analysis in a pediatric cardiology telemedicine system. J Telemed Telecare 1997; 3 Suppl 1:56-57. **USA** University hospital and a regional medical centre in NC	To assess the effects of neonatal echocardiogram transmission on patient management.	Non-randomized study with retrospective controls. Analysis of medical costs.		100 echocardiograms from 48 babies were transmitted. Historical data from 38 babies provided the control.	telechocardiography		Hospital stay decreased by an average of six days in the telemedicine group representing an annual saving of $1.3 million. The differences were, however, not statistically significant in this small sample	Retrospective control group. Reasons other than availability of telemedicine might have contributed to reduction in hospital stay. Projection of savings equates stay in NICU with total hospital stay. Authors point out that a power analysis suggests a sample size of 600 would have been necessary to show statistical significance
Rendina MC. The effect of telemedicine on neonatal intensive care unit length of stay in very low birthweight infants. Proc AMIA Symp 1998;111-115. **USA** NC	To address the effect of the installation and use of a telecardiology system on the intensive care length of stay of very low birthweight (VLBW) newborn infants.	Retrospective comparison of VLBW infants at two centres, one with ad one without telemedicine	Regression analysis, controlling for known risk factors.	314 of 381 VLBW infants surviving until discharge from NICU (177 in telemedicine group, 137 in control). Exclusions of infants due to unavailability of data.	Telecardiology	[Data from a three year period]	LOS reduction in the telemedicine group was statistically significant for infants with a birthweight of less than 960g 9about one third of this population). The magnitude of the difference was about 12.5d (17% of non – telemedicine LOS). There appeared to be no difference in LOS for infants of about 1,300g or more.	Derivation and presentation of the results are brief

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APPENDIX E: CRITIQUE PEDIATRICS

Author / Title / Journal / Year / Country / Location	**Purpose/ Objectives**	**Design**	**Analysis**	**Participants: age/ gender/ groups**	**Intervention/ Duration**	**Follow-up: sample size; dropout**	**Outcomes/ Socio-Economic Indicators**	**Methodological Problems**
Sable C, Roca T, Gold J, Gutierrez A, Gulotta E, Culpepper W. Live transmission of neonatal echocardiograms from underserved areas: accuracy, patient care, and cost. Telemed J 1999; 5(4):339-347. **USA** New Orleans, Alexandria, Lake Charles	To test the hypothesis that live telemedicine guidance and interpretation of neonatal echocardiograms from underserved areas would improve management, prevent unnecessary transports, enhance sonographer proficiency, and result in monetary savings	Case series with cost estimates		Patients with suspected congenital heart disease (n = 29), suspected patent ductus arteriosus (PDA) (n = 27), and hemodynamic instability (n = 4).	tele echocardiography		Over the 7 months of the study, five patient transfers were avoided with estimated cost savings of $35,000. Telemedicine costs were $24,310	Telemedicine staff-related costs not included. Estimates do not include ISDN installation fee, which was waived.

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Sable CA, Cummings SD, Pearson GD, Schratz LM, Cross RC, Quivers ES et al. Impact of telemedicine on the practice of pediatric cardiology in community hospitals. Pediatrics 2002; 109(1):E3. **USA** New Orleans - 2 community hospital nurseries 15 miles from a tertiary care center	To evaluate the impact of telemedicine on delivery of pediatric cardiac care in community hospitals.	Case series with estimates of time savings		n=364 patients with suspected heart disease (most commonly congenital conditions).	tele echocardiography		Telemedicine eliminated the need for consultation in 194 cases and allowed the cardiologist to delay the visit until the end of the day in an additional 26 cases. This resulted in average time savings of 4.2 person-hours/wk based on travel and consultation time.	No details available from this abstract

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Scholz TD, Kienzle MG. Optimizing utilization of pediatric echocardiography and implications for telemedicine. Am J Cardiol 1999; 83(12):1645-1648. **USA** Iowa	to examine utilization and diagnostic yield of community-based echocardiographic services	A comparison of test ordering patterns from physicians (most by telemedicine) and specialists visiting outreach centers.	Numbers of normal and abnormal echoes ordered by community physicians and pediatric cardiologists were compared by chi-square analysis	Pediatric cases referred to community physicians or outreach clinics	Recorded details of echocardiography tests ordered by two groups. Community physicians sent echocardiograms to a hospital laboratory for interpretation. Pediatric cardiologists attending outreach clinics ordered and interpreted echocardiograms.		For children >1 year, much higher proportion (73%) of studies ordered by physicians than by cardiologists (8%). NSD in proportion of normal echoes on <1y children for both groups, SS higher normals in tests ordered by physicians in older children, linked to 12% increase in charges (no details).	Use of proportion of normal tests for those ordered by physicians and cardiologists is confusing, and tends to soften the message that many echoes ordered using telemedicine appeared unnecessary. Incomplete data on numbers of cases in groups. Process details mentioned that study would influence provision of future services. Cost calculations and issues are mentioned, but no details are provided.

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Thome M, Alder B. A telephone intervention to reduce fatigue and symptom distress in mothers with difficult infants in the community. Journal of Advanced Nursing 1999; 29(1):128-137. **Iceland**	to test the effectiveness of a telephone intervention to reduce fatigue and the resulting symptom distress of mothers who reported having a behaviourally difficult infant of 2-3 months of age	RCT; Measures – parental Stress index, Edinburgh Postnatal Depression Scale, new scale for fatigue and resulting symptoms, plus measures of infant difficulty	ANOVA, MANCOVA	Mothers who reached distress criteria of depressive symptoms and parental stress, n=34 for both intervention and control	In a brief telephone intervention both maternal distress and infant difficulty were discussed [nurse counselor].	Duration of 2 months, and maximum of 5 calls per mother – infant pair. No reference to any drop out.	Significant ($P < 0.001$) intervention effect on fatigue and its side-effects.; no interaction effect on maternal expectations of infant behaviour or parental stress.	As noted by authors, limitations included selection of subjects by mailed self-report measures, and brief duration.

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Tsilimigaki A, Maraka S, Tsekoura T, Agelakou V, Vekiou A, Paphitis C et al. Eighteen months' experience with remote diagnosis, management and education in congenital heart disease. J Telemed Telecare 2001; 7(4):239-243. **Greece** Crete, Athens	Pilot study on feasibility of telemedicine in management of children with congenital heart disease.	case series, with comparative cost estimates		93 children with haemodynamically significant cardiac abnormalities	transmission of echocardiograms, with discussion	mentions n=44 managed locally, n=3 transported to Athens urgently, n=46 had scheduled appointment at tertiary centre	Accuracy of the telemedicine diagnosis established. Capital cost of equipment $16,250 per site, telecommunication cost $12.50 per patient, minimum travel and accommodation costs for trip to Athens $440	The limited cost information does not include staff-related items; as the author's note, lost income of parents was not considered.

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Vincent JA, Cavitt DL, Karpawich PP. Diagnostic and cost effectiveness of telemonitoring the pediatric pacemaker patient. Pediatr Cardiol 1997; 18(2):86-90. **USA** Detroit, Children's hospital	To evaluate the diagnostic capabilities and cost effectiveness of telemedicine as part of a pacemaker follow up protocol for children and young adults. The specificity of routine monthly TM to screen for asymptomatic pacemaker dysfunction or new-onset dysrhythmias was 95%, with a negative predictive value of 99%. TM was effective ($p < 0.001$) for correlating the presence or absence of pacemaker problems with subjective complaints at any patient age. Financial charges for use of TM were significantly less ($p < 0.01$) than comparable outpatient visits	Case series with cost comparison	t test for costs, chi square	n= 96 patients, ages 0.2-32.0 years (mean 12.0 years)	Both routine monthly and anytime emergency telemonitoring of ECG	Patients followed up for 3 y after placement of pacemaker	1372 routine transmissions were performed of a recommended 3456 (40% patient compliance). Of these, 99% showed normal rhythm or pacemaker function. The remaining 1% demonstrated asymptomatic pacemaker dysfunctio requiring intervention or new-onset dysrhythmias. A total of 75 emergency transmissions were undertaken for patient/parent-perceived problems, only 8% of which showed pacemaker dysfunction or dysrhythmias. The sensitivity of patient/parent capacity to detect pacemaker problems or dysrhythmias based on clinical findings was 29%, with a positive predictive value of 8%. Total charges for75 emergency telemedicine transmissions was $5,250, compared with projected charges for an ER or clinic visit of $19,500	Only incomplete, illustrative, cost comparison is made.

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Policy Recommendations	**Applicability to Alberta**	**Comments**
Authors conclude that this evidence supports telephone triage as an efficient gatekeeper for health care resources	Unclear; would need to consider current practice ; telephone triage as a generic approach well worth considering, this study gives uncertain support for the approach.	Doubts as to whether this is generalizable.

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Policy Recommendations	**Applicability to Alberta**	**Comments**
SBW is a potentially useful tool to improve the hospital experience for seriously ill children, and help them to be less socially withdrawn	Potentially, could be a valuable approach for a vulnerable population	An interesting example of telemedicine being used while the patient was present in the hospital setting.

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Policy Recommendations	Applicability to Alberta	Comments
Interactive compressed video is an effective medium for teaching and improving MDI technique in this population.	Seems applicable, if a significant need exists.	

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Policy Recommendations	Applicability to Alberta	Comments
Telemedicine in this application well accepted by families and children and provides cost savings	Applicable, likely cost savings for some communities	Details of satisfaction/ acceptance of service not considered here.
These results suggest a simple and effective method to increase kept appointment rates in a variety of public health programs	Appears applicable	

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Policy Recommendations	Applicability to Alberta	Comments
Tele-echocardiography provides a service comparable in availability and accuracy to that provided in a pediatric cardiology division at a major hospital.	Applicable, local validation would be needed	

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APPENDIX E: CRITIQUE PEDIATRICS

Policy Recommendations	Applicability to Alberta	Comments
Data suggest intervention improved family satisfaction with inpatient VLBW care and that use of telemedicine and the Internet to support the educational and emotional needs of families facilitate earlier discharge to home of VLBW infants.	Seems applicable	

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Policy Recommendations	Applicability to Alberta	Comments
Linking ED patients without a medical provider to PCPs via phone is as effective as a face-to-face interaction.	Possibly applicable if seen as necessary	A weak study, general indication of value from such an approach.

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Policy Recommendations	**Applicability to Alberta**	**Comments**
Conclusions. Signing out to a Call Center decreased physicians' after-hours calls by 77% and SLP triage halved the number of urgent after-hours referrals	Applicable if necessary	

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Policy Recommendations	Applicability to Alberta	Comments
Letters followed by automated telephone messages were more effective and cost-effective than either message alone. The cost-effectiveness of automated telephone messages and letters may vary widely depending on the setting, and choices among strategies should be tailored to the populations being served	Feasible method, authors' conclusions are pertinent, consider for specific areas/ populations	This study was included, though only an abstract was available so that there was insufficient information to fully evaluate.

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Policy Recommendations	**Applicability to Alberta**	**Comments**
Specially trained nurses, using a standardized fever protocol, can safely handle telephone calls as pediatric physician surrogates. The introduction of at-home observation periods for young children with fever resulted in decreased after-hours health care facility referrals.	Applicable	

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Policy Recommendations	Applicability to Alberta	Comments
Indicates benefits of tele echo services through timeliness of delivery	Applicable, though comparators would need to be checked for local conditions	Study also includes details of physician satisfaction, which are not considered here.

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Policy Recommendations	**Applicability to Alberta**	**Comments**
The telemedicine link facilitated early diagnosis and initiation of appropriate management in patients with complex congenital heart disease and avoided the need for transfer in those where significant congenital heart disease was excluded	Applicable	A general indication of cost benefits that are achievable with this type of application. This paper also deals with accuracy of diagnosis, which is not considered here.

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Policy Recommendations	Applicability to Alberta	Comments
	Does not appear relevant	

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Policy Recommendations	Applicability to Alberta	Comments
Implication is o support for this application	The same trend might be expected (lower rate of transfer)	

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Policy Recommendations	**Applicability to Alberta**	**Comments**
Authors conclude that while the sample size was inadequate to demonstrate improvements in health outcomes, the magnitude of the change and the low costs of the system suggest that this intervention is practical for obtaining rapid diagnostic and treatment support.	Applicable	

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Policy Recommendations	Applicability to Alberta	Comments
Suggested reduction in hospital costs associated with introduction of telemedicine.	N/A	General indication of benefit from this application; cannot generalize from conditions of study.
Under the circumstances of the study, telemedicine has been an effective intervention to reduce the intensive care length of stay for this group of infants.	Potentially significant, results add to support for this application; would need to confirm under local conditions.	

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APPENDIX E: CRITIQUE PEDIATRICS

Policy Recommendations	**Applicability to Alberta**	**Comments**
Live transmission of neonatal echocardiograms over three ISDN lines improves patient care, and is cost effective	Application applicable	General indicators f cost issues. Image quality, accuracy also considered in the study, not addressed here

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APPENDIX E: CRITIQUE PEDIATRICS

Policy Recommendations	**Applicability to Alberta**	**Comments**
Real-time transmission of neonatal echocardiograms from community hospitals over 3 integrated services digital network lines has the potential to improve patient care, and have a positive impact on referral patterns and time management without increasing the utilization of echocardiography	Applicable	General indication of benefits

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Policy Recommendations	Applicability to Alberta	Comments
Conclude that selection of patients influences diagnostic yield of pediatric echo services. community physicians effectively identified patients < 1 year of age with abnormal echoes, (2) significantly fewer echoes may be required in patients > 1 year of age if patients are first evaluated by a pediatric cardiologist	General principles of ensuring appropriate use of diagnostic tests and adequate training are applicable.	

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Policy Recommendations	Applicability to Alberta	Comments
Concluded that intervention by telephone can be effective with fatigued mothers caring for a difficult infant.	Appears applicable	

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Policy Recommendations	**Applicability to Alberta**	**Comments**
Successful telemedicine application with medical, cost and social benefits As pointed out by the authors, there were considerable social implications for families through reduction of inconvenience and risk of traveling	Tele-echocardiography applicable, valuable potential for small communities	This preliminary study adds to the evidence of benefit from use of tele-ECG, and of TM in remote situations. Making reasonable assumptions on depreciation of equipment, the information presented suggest that from a societal perspective this application was probably cost saving even at this initial stage of operation.

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APPENDIX E: CRITIQUE PEDIATRICS

Policy Recommendations	Applicability to Alberta	Comments
Telephone monitoring provides convenient, simplified pacemaker analysis applicable to all patients	Principle of trans telephonic monitoring applicable, little else from the paper is relevant	A weak study, results not helpful or generalizable. Implications are that any provincial use would require careful integration with health services and appropriate training/ education.

Note: Abbreviations used in this document are described in Appendix D

APPENDIX F: CRITIQUE GERIATRICS

Author / Title / Journal / Year / Country / Location	Purpose/ Objectives	Design	Analysis	Participants: age/ gender/ groups	Intervention/ Duration	Follow-up: sample size; dropout	Outcomes/ Socio-Economic Indicators
Ames D. Psychiatric diagnoses made by the AGECAT system in residents of local authority homes for the elderly: Outcome and diagnostic stability after four years. International Journal of Geriatric Psychiatry 1992; 7(2):83-87. Australia	To establish the reliability of the AGECAT in diagnosing patients	Non-controlled clinical series (VIII) Strength of Evidence (SoE): Poor A computerized diagnostic system (AGECAT) utilizes data derived from a semi structured interview (GMS) to make diagnoses of common psychiatric syndromes among the elderly	Participants interviewed using the GMS in 1985/6, and then again in 1990 New GMS data were analyzed by the AGECAT program as they had been done 4 years prior 2 sets of diagnoses made 4 years apart were compared in order to cast light on the stability and predictive validity of the AGECAT system in this population	n=86 participants underwent the GMS interview in 1985/6	4 year study, initial assessment done in 1985/6 and patients contacted again in 1990	Follow up 48-59 months after initial GMS interview 25 of 86 subjects were still alive to be reinterviewed (71% or 61 patients did not receive follow up	The follow up AGECAT diagnoses indicated impressive diagnostic stability for the organic psychosis cases diagnosed in 1985/6 because as predicted, these cases either died or remained cases of organic psychosis Frequent passing of subjects from one category of depression to the other may have been due to the fact that the psychosis and neurosis categories seem to define levels of severity rather than two clearly differentiated clinical syndromes
Anderson JL, Gilbert EM, Alpert BL, Henthorn RW, Waldo AL, Bhandari AK et al. Prevention of symptomatic recurrences of paroxysmal atrial fibrillation in patients initially tolerating antiarrhythmic therapy. A multicenter, double-blind, crossover study of flecainide and placebo with transtelephonic monitoring. Circulation 1989; 80(6):1557-1570. **USA**	To examine transtelephonic monitoring in the evaluation of paroxysmal arrhythmia's and arrhythmia-related symptoms in outpatients A patient initiated transtelephonic monitor system was used to evaluate the potential of flecainide in prevention of symptomatic recurrences of PAF	RCT (II) SoE: Good Three various aspects of study design 1: Baseline screening phase 2: Open label, dose-ranging phase 3: Double blind, efficacy phase	Quantitative data presented Primary comparisons of the study included the effects of flecainide and placebo therapy on symptomatic PAF attacks during blinded therapy for three independent measures McNemar's test for significant change was used to compare the number of patients who had no attacks while receiving placebo and flecainide therapy	64 patients qualified for the study (2 or more PAF attacks documented within a 4 week baseline period) 55 patients complete dose ranging phase: treatment A 53 entering blinded phase: treatment B 53 patients receiving both treatments in double-blind Patients calculable for efficacy n=48 Evaluable patients mean age 56 (range 23-83 years) m=30 f=18	Dose was incremented at weekly intervals from 200-300 and finally to 400mg/day 16 week trial Patients used transtelephonic monitor to transmit data. A total of 2375 transtelephonic rhythm strips and accompanying symptom reports were logged. Of these, 1314 (55.3%) represented symptomatic calls and 1061 (44.7%), asymptomatic (routine) calls.	13 patients dropped out of study 7 because of adverse effects (five cardiac) 5 for other reasons 1 because of cardiac arrest/death	Study demonstrates highly significant correlation between perceived symptoms and documented PAF by transtelephonic monitoring Rate of symptoms and PAF attacks significantly reduced by therapy PAF was prevented in 15 patients during flecainide and four during placebo therapy Increased time between attacks

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Anon. Solid outcomes show e-heath and chronically ill senior populations are compatible. Disease Management Advisor 2001; 7(7):103-106. **USA**	How the Internet can help seniors	RCT (II) SoE: Poor Pilot study	Not reported	Participants identified with the use of claims data and physician referrals n=69 elderly patients with moderate to severe CHF 62 patients were divided between an Internet-based intervention group and an interactive voice response (IVR)-based intervention group Remaining 7 patients received usual care	Participants were asked to report on their pulse, weight, BP, chest pain, shortness of breath, whether they would like to speak to a nurse Participants in the IVR intervention were able to answer these questions using the telephone key pad which took about 4 minutes Computer users answered these questions online in about 5 minutes Info transmitted reviewed by a nurse	Not reported	Both intervention groups experienced decreases in cardiac costs Computer group seemed to fare better than telephone group in terms of utilization, and experienced fewer hospitalization rates
Ball C, Tyrrell J, Long C. Scoring written material from the Mini-Mental State Examination: a comparison of face-to-face, fax and video-linked scoring. J Telemed Telecare 1999; 5(4):253-256. **France, UK**	To assess the reliability of scoring written items of the Mini-Mental Examination (MMSE) using different modes: in-person, fax and V/C	Case-control - retrospective study (VII) SoE: Poor	The reliability of scores in the video-link and fax modes were compared with the in person mode using the kappa statistic McNemar test was used to compare the number of responses that could not be scored between the fax and video-link modes All stats were calculated using SPSS	n=99 records of geriatric mental health patients who had undergone a complete MMSE with scoring mean age 80 years (range 45-91) m=30 f=69	3 raters each scored 33 of the MMSEs in each of the 3 modes, over video-link, using a faxed copy, and in person	99 participants completed the study	Results suggest that the written material of the MMSE can be reliably scored after transfer by fax machine, but the situation is less clear when a low cost V/C system is used Sentences could be interpreted reliably when viewed over the video link but the interpretation of pentagrams was less reliable

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Berkman P, Heinik J, Rosenthal M, Burke M. Supportive telephone outreach as an interventional strategy for elderly patients in a period of crisis. Social Work in Health Care 1999; 28(4):63-76. **Israel**	Paper describes a telephone "checking in " service provided to elderly people normally part of a hospital's home care unit to whom services were disrupted during th Gulf War in 1991	Non Controlled Clinical Series (VIII) SoE: Poor	Data analyzed using SPSS Chi square t-tests	n=93 patients were randomly divided into two groups: RS-NTP group that comprised of 30 patients who were selected to receive telephone support calls from a three member secretarial staff (the non-professional team and the RS-PT group that consisted of 63 patients who were selected to be called by the three social workers (the professional team) Mean age=74 years 52% female	Telephone calls were made once a week during a five week time frame Asked questions about anxiety and coping	Final n=74; 19 dropouts Several weeks after the end of the war, patients were sent a postal q'aire	A comparison of the characteristics of the RS-NPT group and the RS-PT group showed no statistical difference between the two with respect to demographic parameters and degree of success in making telephone contact There was significant statistical difference between the two groups with respect to the number of calls made to each household (professional team made more calls)

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Bondmass M, Bolger N, Castro G, Avitall B. The effect of home monitoring and telemanagement on blood pressure control among African Americans. Telemedicine Journal 2000; 6(1):15-23. **USA**	Objectives of the study were to determine Compliance with home blood pressure monitoring among hypertensive African Americans, and The effectiveness of telemanagement in blood pressure control within 1-3 months	Non controlled clinical series (VIII) SoE: Poor One-group, pre-post design	Data for all variables were tested for normal distribution using the Komolgorov-Smirnov Goodness-of-Fit test ANOVA with Tukey's post hoc test used for within-subject comparisons for normally distributed continuous variables Chi square tests for any discrete variables Pearson product-moment for bivariate correlations Wilcoxon rank-sum test for non-normally distributed categorical and continuos variables Descriptive stats and frequencies were used for demographics and patient characteristics SPSS Alpha level 0.05 determined level of significance QoL assessed at baseline and at study completion	50 self and physician referred patients were screened for eligibility 11 patients were excluded from data analysis because they demonstrated sufficient BP control 2 more excluded because they did not have phone 4 more excluded because of non compliance Final n=33 African Americans with one or more years of uncontrolled BP while on meds Mean age of cohort 51.5 years 24/33 patients were female	Interventions were conducted over the phone including patient education and medication titration congruent with JNC-VI guidelines 90 day study	Four patients dropped out leaving final n=33 whose data were analyzed No follow-up	Systolic and diastolic blood pressure were both significantly reduced Quality of life post scores were not statistically changed from baseline scores
Bratton RL, Short TM. Patient satisfaction with telemedicine: a comparison study of geriatric patients. J Telemed Telecare 2001; 7 Suppl 2:85-86. **USA**	Review of patient satisfaction with telemedicine	Survey (VIII) SoE: Poor Recruitment of volunteers	Patient satisfaction was recorded on a 5 point likert scale	n=20 volunteer participants Volunteers selected at random from those who attended a 30 minute orientation session	Telemedicine visit consisted of recording the patient's temperature, BP, pulse and weight, and listening to lungs Once a week over 8 weeks	Q'aire given to patients after 8 weeks, 18 of 20 completed q'aire	Participants reported general patient satisfaction with use of telemedicine

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Brennan PF, Moore SM. Networks for home care support: the ComputerLink project. Caring 1994; 8(8):64-66. **USA** Cleveland, Ohio	ComputerLink Project developed to provide caregivers of persons with Alzheimer's Disease (AD) support in the home	RCT (II) SoE: Poor Randomized ComputerLink experiment	Behavioural indicators of use (counts of computer access, content of messages) serve as data in this experiment Computerlink use and transcripts were recorded	n=102 Primary Caregivers of a person with AD (spouses or children of AD patients) n=51 experimental group n=51 comparison f=66 m=32 One nurse oversees the project: reads all public areas daily, maintains Electronic Encyclopedia, responds to communications & troubleshoots for participants (by e-mail).	Computerlink provided 3 support services to caregivers: - information (Electronic Encyclopedia re. AD), - decision support - communication (electronic bulletin board, private e-mail among participants, anonymous e-mail to nurse) Duration of study not reported (but is at least nine months as one subject dropped out in month nine) Intervention was computer use	102 subjects began the study and 6 dropped out over the course of the study	47 experimental group members accessed Computerlink 4364 times with a mean of 92 times Greatest areas of use were private mail among caregivers and use of Electronic Encyclopedia, esp. re. Caring for the Person with AD Private mail was used extensively and 749 messages were posted where content was reflective of all dimensions of social support Questions posted in Q&A focused on 4 main themes: managing the person with the disease, traveling with an AD person, managing one's own feelings, preparing for death
Cameron K, Hughes K, Doughty K. Reducing fall incidence in community elders by telecare using predictive systems. Proceedings of the 19th IE EE Engineering in Medicine and Biology Society Conference 1997; 3:1036-1039 **UK**	Paper describes a fall prediction system based on data collected via a home based sensor system	Descriptive study (VIII) SoE: Poor	Fall risk factors, age and gender are identified Statistical studies have been used previously to derive specific risk factors leading to a fall A multiple logistic progression method was used to determine an adjusted odds ratio for each factor	No Participants	None	None	A prototype system had been designed to automatically warn of an increase in the risk of a fall by an elderly person

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Carroll DL, Robinson E, Buselli E, Berry D, Rankin SH. Activities of the APN to enhance unpartnered elders self-efficacy after myocardial infarction. Clinical Nurse Specialist 2001:60-66. **USA**	To describe the activities of an APN (advanced practice nurse) in a nurse-coached intervention study for unpartnered elders post-myocardial infarction.	Qualitative Data consisted of free-text comments written by the APN.	Data was compiled as a log for each subject. The process of data reduction, data display, conclusion drawing, and verification were grounded in the recommendations of Miles and Huberman (qualitative data analysis). Validity was established by an extensive audit trail articulated all design decisions and interpretations.	The participants were three APN's who functioned as the APN coaches in this study. They were all clinical nurse specialists with a cardiovascular focus to their clinical practice. They provided coaching to a randomly assigned group of post-myocardial infarction elders (44)	Each subject had a weekly contact for 12 weeks with the APN via the telephone. During the initial telephone call, the APN explained who she was, and that she, with the subject's permission, would be calling each week to provide a source of support and guidance during the patient's recovery. Also during the first telephone call, the APN ascertained the safety of the individual and initiated relationship development. Questions were asked regarding the patient's symptoms, level of activity. Further telephone calls proceeded on a weekly basis to provide social persuasion and to outline strategies to manage the subjects physiologic state.	n=44 (patients in the APN-coached intervention). N=3 for APN's.	Synthesis of the data revealed 4 themes of activities. Patient education, validation/feedback, encouragement support and problem solving. The APN provided patient education. Self-management techniques about diet, activity, medication adherence were all part of the content of the telephone intervention. The APN listened attentively to the elder, but then validated and affirmed the patient's thinking, experiences, progress and accomplishments. The APN provided significant support and encouragement. The elders perceived themselves to be quite vulnerable during the study period. The APN provided a level of professional social support. The APN assisted the elders with decision making and facilitated collaboration of the elders with their family and other members of the health team.

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APPENDIX F: CRITIQUE GERIATRICS

Author / Title / Journal / Year / Country / Location	Purpose/ Objectives	Design	Analysis	Participants: age/ gender/ groups	Intervention/ Duration	Follow-up: sample size; dropout	Outcomes/ Socio-Economic Indicators
Castro CM, King AC, Brassington GS. Telephone versus mail interventions for maintenance of physical activity in older adults. Health Psychol 2001; 20(6):438-444. **USA**	Purpose was to evaluate telephone and mail-mediated interventions on physical activity maintenance in middle aged older adults	RCT (II) SoE: Poor 2 year randomized clinical trial of four different exercise training conditions Participants recruited through a random-digit-dialed telephone survey in Sunnyvale, California, and a community wide advertisement Eligibility criteria were current resident with no intention of moving in 2 years; 50-65 years, no cardiovascular disease or stroke; no regular exercise; able to participate in moderate activity; (females) post menopausal. The selection of participants was stratified by exercise training condition and intervention program to ensure equal, random sampling	An analysis plan was derived to examine the differences in adherence during the second year of the study Analyses performed using SAS statistical software	Year 1 sample size not give Year 2: n=140 f=60; m=80 average age = 56.3 years most married, Caucasian, employed n=65 participants were originally randomized to the lower intensity home based condition and n=75 participants randomized to the higher intensity home based condition. Approx. equal proportions of participants were randomized to each of the two Year 2 maintenance programs: high intensity condition, 48% of participants assigned to telephone and mail program and 52% assigned to a predominantly mail-mediated program; for low intensity 41% and 49% of participants assigned to telephone and mail and mail-mediated programs, respectively	2 year study. During yr 1 all participants received phone counseling calls once a week for the first 4 weeks, biweekly for the following 4 weeks, then monthly for 12 months At the end of year 1, participants in the home based conditions were randomized into one of 2 maintenance programs for the 2nd yr of the trial: telephone and mail contact or predominantly mail contact. During yr 2 all participants were encouraged to continue exercising at the same intensity that they were assigned as baseline. All participants were called weekly for the first 4 weeks of yr 2	179 participants originally enrolled in year 1, 39 declined to continue in year 2	Counter to expectations, participants in the higher intensity condition who received mostly mailings achieved greater adherence than did those who received monthly telephone counseling and mail Possible explanation for lack of added benefit of telephone counseling could be participants' previous exposure to telephone delivered exercise counseling in the first year of the trial
Chan M, Bocquet H, Campo E, Val T, Esteve D, Pous J. Multisensor system and artificial intelligence in housing for the elderly. Stud Health Technol Inform 1998; 48:145-149. **France**	Review of multisensor systems for artificial intelligence in housing for the elderly that may warn professionals of change in patient behaviour	Descriptive study (VIII) SoE: Poor	None	None	None	None	Discusses various types of supervision

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Coogle CL, Osgood NJ, Parham IA, Helen E, Churcher CS. Effectiveness of videoconferencing in geriatric alcoholism education. Gerontology and Geriatrics Education 1995; 16(2):73-83. **USA** Virginia	An interactive satellite teleconference was scheduled to be broadcast nationwide Providing education on elderly alcoholism to older adults, their family caregivers, service providers in aging, providers of mental health and substance abuse services, professionals	Descriptive (VIII) SoE: Poor Preconference and postconference questionnaire	Some statistical analyses mentioned t-tests and chi square	Potential participant number not given, but of the potential participants 134 attended the teleconference n=87 identified as service providers n=9 identified as adults or older caregivers n=19 did not identify	2 hour teleconference	134 participants attended conference 115 completed both the pre and post test q'aire	Significant overall knowledge gain for the 115 participants Conclude that the live, interactive teleconferencing is an effective vehicle for the delivery of education about alcoholism and substance abuse in older adults Cost effective
De Leo D, Carollo G, Dello BM. Lower suicide rates associated with a Tele-Help/Tele-Check service for the elderly at home. American Journal of Psychiatry 1995; 152(4):632-634. **Italy**	To determine the impact on suicidal behaviour of telehelp, telecheck, a telephone service designed to provide elderly people with home assistance	Cohort study (VI) SoE: Poor Rate of suicide among telehelp/telecheck service clients was determined through 2 separate data sources Authors determined the number of suicides among 12135 elderly subjects who were connected to the tele service in the region over 4 years and compared it with the suicide rate for the general population in the region	observed vs. expected suicides standardized mortality ratio	n= 12135 elderly service clients connected to Tele-Help/Tele-Check service mean age 79.04 years f=10150 mean age 79.05 m=1985 mean age 79.03	4 year study Jan. 1, 1988 - Dec. 31, 1991 Tele-Help - a portable device that lets users send alarm signals activating help Tele-Check - trained staff member contacts each client ~ 2x/week	Out of 2135 deaths over 4 years, reliable information was obtained for only 2058, 1875 of which were deaths of people aged >= 65 yrs	In the 4 year period studied, only one case of suicide found by one woman which represented a significantly lower suicide rate than was expected on the basis on general population suicide rates Tele-Help/Tele-Check service provides crisis intervention and social, medical, and psychological support.

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de Lusignan S, Wells S, Johnson P, Meredith K, Leatham E. Compliance and effectiveness of 1 year's home telemonitoring. The report of a pilot study of patients with chronic heart failure. Eur J Heart Fail 2001; 3(6):723-730. **UK**	To examine the acceptability, effectiveness, and reliability of home telemonitoring	Small-sample RCT (III) SoE: Good to Fair Controlled pilot Patients identified with the diagnosis of heart failure from the computer database and eligible patients were invited to join the study Those who agreed to participate received confirmation of diagnosis Patients then randomly assigned to the control or TM group	Effectiveness of telemedicine was evaluated by: compliance with self measurement regime; comparison of control weight, pulse and BP in both groups; comparison of prescribed meds in both groups; q'aire on usefulness of V/C; Quality of Life and Heart Failure Health Status q'aires; reliability of the technology	n=20 total (24 asked to consent and 20 did) geriatric Chronic Heart Failure patients Control group n=10 Telemonitoring group n=10 average age of participants 75.2 years	Intervention group monitored their vital signs, info then transferred to telephone and then to server at hospital for review by clinician TM group also had ability to consult Control group receives standard practice treatment One year study	2 patients dropped out and 5 deaths n=13 completed the study	No significant differences between quality of life and chronic heart failure q'aire scores between the two groups V/C started with enthusiasm but became less useful Video did not seem to offer advantages over telephone consultation Patients would have preferred to see physician face to face
Fowkes W, Christenson D, McKAy D. An analysis of the use of the telephone in the management of patients in skilled nursing facilities. JAGS 1997; 45:67-70. **USA**	To characterize the nature of the telephone communication in the care of patients in skilled nursing facilities, noting numbers of calls, reasons for communication, and the outcomes of the interactions, and to implement a voice mail system to manage the burden of communication more effectively and describe the impact of this system.	Descriptive study (VIII) SoE: Poor An archival descriptive study of phone message data covering a period of 1 year. Includes intervention and an evaluation of a voice mail system at the conclusion of the year's study.	Total number of calls were tabulated by patient and by facility. Reasons for call, outcomes and timings were tabulated.	Medical care providers, the staffs of 13 skilled nursing facilities, and an average of 207 covered patients followed for 1 year. Only those calls received concerning nursing home residents are represented.	Information was logged on a data collection form at the time the call was received during the study period. Data recorded included date, time of day, the SNF in which the patient resided, the site of the origin of the call, the reason for the call, outcome of the call, and any problems encountered. The level of urgency was determined at the time of coding based on the content of the call as urgent, routine, or information only.	During the study period in the practice cared for an average of more than 300 patients on an ongoing basis around the clock. An average of 207 patients were cared for continuously in 15 different skilled nursing facilities. During the year of study, 10, 264 calls were received.	Average time consumed by the call was 2 minutes and 13 seconds. Approximately 4 calls per patient per month. Different reasons for the initiation of the calls (new event, acute illness, new observation, deterioration in an established condition, consultation request, to name a few). 96% of the calls categorized were routine or information only. A voice mail system was instituted at the end of the study. The voice mail system saved 35 minutes of time during an average work day. Savings in cost is significant. Answering service is $150/max 200 calls. If all voice mails came through the answering service, charge would be $850

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Friedman RH, Kazis LE, Jette A, Smith MB, Stollerman J, Torgerson J et al. A telecommunications system for monitoring and counseling patients with hypertension. Impact on medication adherence and blood pressure control. Am J Hypertens 1996; 9(4 Pt 1):285-292. **USA** Massachusetts	Study was conducted to evaluate the effect of automated telephone patient monitoring and counseling on patient adherence to antihypertensive meds and on blood pressure control	RCT (II) SoE: Good Study compared patients with hypertension who were randomly assigned to TLC (telephone linked computer) and who continued to receive their regular medical care and subjects who received their regular medical care Conducted in 29 greater Boston area communities	-Structured interviews were conducted at baseline -Q'aire used to evaluate participants' attitudes about computer technology applied to health care -Scales from the Short Form 36 (SF36) were used to measure health status -t tests used to compare change scores for TLC users and usual care subjects -Ordinary least squares regression was used to generate adjusted change scores to analyze differences between the two groups -Cost-effectiveness ratios were computed for medication adherence improvement and DBP decrease using simple linear regression analysis	Eligibility criteria described Total of 964 potentially eligible subjects were identified 537 individuals were scheduled for a home visit 299 confirmed as eligible to participate in study TLC group n=133 average age 76 years 75% female Usual Care group n=134 average age 77 years 79% female	2 home visits conducted 6 months apart Weekly, subjects in the telephone group reported self measured blood pressures, knowledge and adherence to antihypertension medication regiments and medication side effects 2 BP measurements were taken at each home visit by technicians Antihypertensive medication adherence was assessed by a home pill count audit	299 patients enrolled in the study and 267 completed the study (32 patients did not complete)	-Use of routine, weekly computer based, automated telephone monitoring of hypertensive patients was associated with significantly reduced DBP and possibly lower SBP -There were associations between TLC use, antihypertensive medication adherence, and blood pressure control. For TLC users, the most substantial improvements in BP occurred in those who experienced an increase in adherence to their antihypertensive med regimen during the study -Potential mechanism of action of TLC monitoring might be to affect physician behaviour ie. physicians could adjust meds or counsel patient -May have been direct effects of the telephone conversations on BP level -Found inexpensive to use
Fulmer TT, Hollander Feldman P, Sook Kim T, Carty B, Beers M, Molina M, Putnam M. An Intervention Study to Enhance Medication Compliance in Community-Dwelling Elderly Individuals. Journal of Gerontological Nursing, 1999; August: 6-14. **USA** New York	To determine whether daily videophone or regular telephone reminders would increase the proportion of prescribed cardiac medications taken in a sample of elderly individuals with congestive heart failure CHF).	RCT (II) SoE: Good Three arms of the study: control group, daily videotelephone call group, and daily telephone call group Elderly individuals (age 65+) were recruited to participate; participants were referred from 2 sources, a home health care agency and an ambulatory care clinic	Mental status screen done for each patient (included SF-36 and MLHF questionnaire) Computerized medication cap placed on participant's bottle was used to measure compliance SPSS and MANOVA, ANOVA	Approx. 600 eligible patients were referred, and all offered $20 to participate 60 agreed to participate n=18 participants in the control group mean age 73.7 years n=15 participants in the group that received daily telephone calls mean age 76.2 years n=17 in the group that received daily videotelephone calls mean age 73.1 years	Protocol included a 2 week period of baseline compliance monitoring, a 6 week intervention phase with daily telephone or videotelephone calls, and a 2 week post-intervention period; caps were then picked up and at this time a post interview was conducted	Subsequent to randomization, 4 patients died, 2 sets of caps were lost, and 4 people withdrew from the study. These 10 subjects were excluded from the analysis	There was a significant fall off in the control group's medication compliance rate over time compared to the rates of the two intervention groups -Compliance of the control group fell 24% but compliance in the two intervention groups fluctuated no more than 2% There was an absence of significant differences between the two intervention groups This method of monitoring is inexpensive

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Gallienne RL, Moore SM, Brennan PF. Alzheimer's caregivers: psychosocial support via computer networks. Journal of Gerontological Nursing 1993; 19(12):15-22. **USA** Cleveland, Ohio	Article presents the creative use of support of caregivers (of Alzheimer's disease) via a computer network called Computerlink	Descriptive (VIII); Qualitative Three types of psychosocial support noted: instrumental support, emotional support, and spiritual support		47 caregivers had access to the Computerlink forum average age of caregivers was 60.3 years (range 19-83) n=32 female n=15 male mean length of caregiving r'ship at beginning of project was 30 months	Three interaction interludes described to illustrate how the network provided emotional, spiritual, and instrumental support to caregivers	47 caregivers had access to computer forum, and 3 examples of interaction are provided	Nurses provide instrumental, emotional, and spiritual support to caregivers Exchanging messages helpful for caregivers

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Go RC, Duke LW, Harrell LE, Cody H, Bassett SS, Folstein MF et al. Development and validation of a Structured Telephone Interview for Dementia Assessment (STIDA): the NIMH Genetics Initiative. J Geriatr Psychiatry Neurol 1997; 10(4):161-167. **USA**	To assess the feasibility, acceptability, validity of a structured telephone interview (STIDA) to distinguish individuals with normal cognitive functioning from those with early Alzheimer's disease Two phases: 1. Development study: feasibility and acceptability of the STIDA, correspondence with standard Clinical Dementia Rating (CDR) Scale 2. Validation Study	Case control study (VII) SoE: Fair Phase 2, clinician blinded to previous telephone-based STIDA results Note: STIDA consists of 3 parts: 1) relevant medical history used to indentify possible causes of dementia 2) reported current cognitive abilities and funtional status 3) cognitive screening test First 2 parts can be administered to a knowledgable informant, last part can only be completed by the patient	differences in scores between Subject only and Informant/Subject methods tested using ANOVA sensitivity and specificity of subject-only and informant/subject STIDA reported, based on gold standard, i.e., CDR derived by clinician ftf interview Kappa coefficient to measure agreement in scores	Phase 1 n=18 AD patients and mean age 70.38 f=8 m=10 n=18 knowledgable informants for each patient n=5 non-AD patients Phase 2 n=28 subjects: mildly demented, questionably demented, or normal first-degree relatives of AD patients n=28 knowledgable informants for each subject	Phase 1 - all subjects administered STIDA in ftf sessions (first 2 parts only to Informants) - Subject-only and Informant/Subject STIDA scores & CDRs calculated - AD and non-AD patients administered ftf standardized structured interview (clinician CDR) Phase 2 - STIDA administered to subjects (first 2 parts only to informants) by phone - Subject-only and I/S STIDA scores & CDRs calculated - ftf interview administered to subjects 2 wks later, CDR score obtained	Phase 2, ftf interview delayed 2 weeks No drop out reported	STIDA is readily tolerated. All participants were willing to provide the requested information and completed the interview successfully. Phase 1 Subject-STIDA agreed with clinician CDR in 15/18 cases; Informant/Subject STIDA agreed with clinincian CDR in 17/18 cases. Near-perfect inter-rater reliability. Phase 2 STIDA shows excellent validity compared to ftf clinical interview Informant/Subject method can detect impairment with sensitivity of .93 and specificity of .92 (Subject only method, .80, .85) While the Informant/Subject is the optimal form, the STIDA can be used with subjects alone in many applications A short STIDA may be useful as a quick screening toll to determine possible dementia.
Hegarty K, Byrne G, Del Mar C. A pilot study of computer-assisted screening for depression in the elderly in general practice. Informatics in Healthcare Australia 1996; 5(4):166-168. **Australia** Brisbane	Evaluate general practitioner (GP) and patient acceptability of a computer based screening instrument for the purpose of diagnosing depression in elderly patients	Cohort study (VI) SoE: Poor	None	102 eligible patients (came into the waiting room that day) age >=65 n=58 not offered the computer test (main reason was insufficient time for reception staff to give out and explain computer) n=13 refused n=31 patients completed questionnaire	Reception staff offered patients a notebook computer which delivered the questionnaire and recorded responses while they waited for their consultation. The patients then carried the computer into the consultation where the GP could generate a report of the patients' responses.	No follow up	It was found that the computer based screening instrument was acceptable to most elderly patients and their GPs

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Hunkeler EM, Meresman JF, Hargreaves WA, Fireman B, Berman WH, Kirsch AJ et al. Efficacy of nurse telehealth care and peer support in augmenting treatment of depression in primary care. Arch Fam Med 2000; 9(8):700-708. **USA** San Fransisco	To evaluate the efficacy of 2 augmentations to antidepressant drug treatment	RCT (II) SoE: Good Patients randomized to 1 of 3 groups 1. Usual physician care (control group) 2. Usual physician + nurse TH care 3. Usual physician care + nurse TH + peer support Overall study population was allocated 40% to condition 1, 40% to condition 2 and 20% to condition 3 patients randomly assigned Outcome measures included the self report version of the Hamilton Depression Rating Scale, the Beck Depression Inventory, and the SF12 Mental and Physical Composite Scales	Hypotheses: 1. that nurse telehealth care leads to better outcomes than usual physician - intervention groups were compared on each outcome variable while controlling for the baseline level of that outcome - logistic regression and Wilcoxon rank sum test 2. effect of nurse telehealth care on medication adherence - tested using 3 interview questions covering current antidepressant drug use - chi square and t tests used 3. effects on outcomes of adding peer support to nurse TH	Patients recruited during an 18 month period dx of major depression or dysthymia & prescribed antidepressant medication 486 patients referred to study; 116 ineligible, 68 refused, 302 enrolled f=69% average age 55.4 years, range 19-90 demographics on education and race given group 1: n=123 group 2: n=117 group 3: n=62	Nurse TH consisted of total 12-14 calls to each patient over 16 week period - discussed issues with medications, offered emotional support, reviewed patient activities Peers were trained volunteers who had a successfully treated episode of depression or dysthymia - peers matched by age & sex to patients - made phone or in-person contact with patient over 6 month period Assessments conducted at baseline, 6 weeks and 6 months	n=302 patients enrolled n=271 interviewed at 6 weeks n=256 interviewed at 6 months total dropout n=46	Nurse telehealth care was superior to physician care with respect to reduced symptoms, improved functioning, and greater satisfaction with care for depression. At 6 mo., more nurse TH patients had 50% reduction in Hamilton Depression Rating Scale (p=.003) and Beck Depression Inventory (p=.05), and had higher treatment satisfaction (p <.001) and drug information satisfaction scores (p <.01) There was no significant difference in medication adherence between nurse TH and usual care groups. Adding peer support to nurse TH did not improve outcomes

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Infante-Rivard C, Krieger M, Petitclerc M, Baumgarten M. a telephone support service to reduce medical care use among the elderly. JAGS 1988; 36:306-311. **Canada** Quebec	To determine whether a telephone support system could reduce the frequency of ambulatory physician encounters.	RCT (II) SoE: Good	Multiple linear regression was performed in order to determine the effect of study group membership on the number of physician encounters, while controlling for important prognostic factors. Interaction effects were tested.	All persons age 65+ at one hospital in Montreal during the last 6 months of 1983 were identified n=182 subjects were assigned by simple randomization to a telephone support group (TG n=71) or to a control group (CG n=71) using a random number table	The experimental intervention consisted of regular telephone calls initiated by a public health nurse with specialized training in geriatrics. She telephoned participants every 8 weeks for 48 weeks, or for as long as they stayed in the study. During the conversation, the nurse aimed to reach the following objectives: 1. let the elderly person talk about his or her health and answer questions related to it. 2. promote a healthy lifestyle. 3. encourage self-care 4. offer emotional support.	outcome data not available for 40 subjects final n=142; 71 in each group.	On average, those in the control group visited the physician more often than the subjects in the study group. The significant variables that suggested higher utilization were subjects who were older, female, received home care services, lived alone, could walk without help, and had fewer diagnoses. In none of the subgroups analyzed (i.e., age, sex, social, dx) was there a statistically significant difference re. effectiveness of the intervention.

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Johnston D, Jones BN, III. Telepsychiatry consultations to a rural nursing facility: a 2-year experience. J Geriatr Psychiatry Neurol 2001; 14(2):72-75. **USA** North Carolina	This paper describes the operation of telepsychiatry consultation service provided from an academic medical center to a skilled nursing facility in a rural setting	Non-controlled clinical series (VIII) SoE: Poor	Not reported	40 patients mean age 79.3 years (range 60-95) Most common reason for referral was dementia	71 telepsychiatry consultations via low cost ISDN V/C equipment were provided over the 2 year period to 40 patients Link established between academic medical centre and rural skilled nursing facility Average duration of the consultation period was about 3 months	Not reported	Two years experience has demonstrated that the weekly teleconsult service has several advantages over the previous arrangement of a monthly on site visit including: -travel time eliminated -consultant maintains a weekly presence at the remote facility permitting more continuous contact with patients and staff and more successful follow through of recommendations -families and patient appreciate the availability of the service
Johnstone HM. Quality outcomes of nursing tele-visits. George Mason University, 2000. **USA**	The purpose of this dissertation was to compare quality outcomes between home health patients receiving nursing tele-visits and home health patients receiving traditional nursing visits	Descriptive study (VIII) SoE: Poor A comparative, descriptive design was used to plan the investigation	Descriptive statistical analyses and inferential statistics were used	Participants were found at 2 sites Site A: Kansas Site B: West Virginia Final sample consisted of 166 home health patients who had not been eliminated; 57 were from Site A (mean age 75.5 years) and 109 were from site B (mean age 70.3 years). At site A, 12 patients received nursing tele-visits and 49 received traditional nursing visits. At site B all patients received traditional nursing visits.			There were no statistically significant differences in cost outcomes between home health patients who received nursing tele-visits and home health patients who received traditional nursing visits -When effects of age, location, and severity of illness were controlled for, home health patients who received nursing tele-visits were more satisfied than home health patients who received traditional nursing visits

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Jones III BN, Johnston D, Reboussin B, McCall WV. Reliability of telepsychiatry assessments: subjective versus observational ratings. J or Geriatric Psychiatry and Neurology 2001; 14:66-71. **USA** North Carolina	Goal was to test the hypothesis that V/C ratings based on visual observations of behaviour would be less reliable than rating based on patients' verbal reports of symptoms	Case control study (VII) SoE: Fair-Poor Semistructured interview	Brief Psychiatric Rating Scale (BPRS) BPRS items classified as Subjective - relied primarily on patient's verbal responses, or Observational - relied on visual assessment Reliability for BPRS scores evaluated by estimating the intraclass correlation between two sets of ratings using a one way analysis of variance random effects model Also used: kappa stats	3 clinicians involved: TM Interviewer, TM Observer, and Ftf Observer. Clinicians rotated positions. n=30 geriatric psychiatric patients n=18 patients interviewed with Ftf and TM Observers present n=12 patients interviewed with Ftf observer only f=22 m=8 average age 66.4 years	V/C assessments of 30 geriatric patients using low-bandwidth (ISDN) equipment were compared to gold standard ftf assessments Patient interviewed via V/C by TM Interviewer; interview observed by Ftf Observer (in room with patient) and TM Observer (in room with TM Interviewer) blinding not discussed duration not reported	Missing data on 3 interviews Final n =27 interviews included for BPRS analysis	Ratings of psychiatric patients made using V/C equipment to see and hear patients are generally reliable. Regardless of position, there was significant agreement between clinicians in their overall ratings of geriatric patients made using the BPRS. Lower reliability for observational BPRS items Visual ratings of geriatric patients do suffer when using low-bandwidth TM systems - though the differences were not statistically significant.
Lyketsos CG, Roques C, Hovanec L, Jones BN, III. Telemedicine use and the reduction of psychiatric admissions from a long-term care facility. J Geriatr Psychiatry Neurol 2001; 14(2):76-79. **USA** Maryland	Article discusses the Copper Ridge/Johns Hopkins telemedicine project and how its operation appears to have brought about a reduction in psychiatric admissions	Descriptive - program evaluation (VIII) S0E: Poor	Compared # hospitalizations, # hospital days, and staff report of successful reintegration of residents Comparison period: one year pre-TM (97/98) to one year post-TM (98/99)	All patients considered for hospitalization - actual numbers not reported - no patient-specific data	V/C system used for twice-weekly calls between the hospital Neuropsychiatry unit and the Copper Ridge (CR) long-term care facility to discuss CR residents who were about to be hospitalized, who were currently or had been recently hospitalized. - if possible, hospital staff also interviewed the patients	None	Telemedicine program served as an effective bridge between the long term and acute care teams in the continuum of care During the first year of the operation of the TM program there was a decline in the number of hospitalizations and the total number of days spent in the hospital

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Macduff C et al. Telemedicine in rural care. Part 2: assessing the wider issues. Nursing Standard 2001; 15(33): 33-37. **UK**	To discuss findings of an evaluation study, and related to the wider picture of nursing involvement in teleconsultation.	Descriptive study (VIII) SoE: Poor Descriptive study dealing with the issues raised the evaluation of a telemedicine program in Scotland	none mentioned.	The evaluation study they described focused on a small village population in Scotland.	Describes how nurse-led telemedicine was implemented in the village. There is a video link consultation process in the village.	not applicable.	There were several issues that the article addresses, such as the nature and scope of development, the experience of the video link, the perceived effectiveness, perceived efficiency, and perceptions of users. The video link emerged as a small but useful contributor. Those who used it were generally satisfied with it. Some doubted as to whether the service was as good as seeing their doctor in person. It was convenient for the patients.
Magnusson L, Berthold H, Brito L, Chambers M, Daly T, Emery D. ACTION: assisting carers using telematics interventions to meet older person's needs. Nursing informatics: the impact of nursing knowledge on health care informatics. Proceedings of NI'97, Sixth Triennial International Congress of IMIA-NI, Nursing Informatics of International Medical Informatics Association. Amsterdam, Netherlands: IOS Press, 1997: 551. **Europe**	ACTION system is designed to maintain or enhance quality of life for older disabled and carers; enhance knowledge, skills and competence of family carers; meet carers need to improve emotional support; and provide carers with ability to develop enriching activities to improve the QOL of those cared for	Qualitative Needs of family carers were assessed using focus groups with family and professional carers and 451 completed q'aires Project seeks to develop a prototype including equipment and Intranet system Software is being produced in areas such as caring in daily life, planning for respite and long term care, coping and emergency situations; and financial information	No description of analysis on q'aires or focus groups	Majority of carers female, older than 45 Cared people noted as being mostly women over 75 years of age	Future project activity will concentrate on validation of the ACTION system in all partner countries. The entire set of ACTION products and services will be tested and evaluated in 40 private homes, nursing and residential homes, hospitals and health care centres, resulting in total 64 sites and approx. 600 people	Not reported	Anticipated carer benefits include: Direct access to care info and practical advice which will improve the carers' competence and their ability to provide care Opportunities for older people and their family carers to plan for long term care and acquire info about the local respite facilities available Clarification so that family carers realize the financial benefits and econ support they can claim Using social cognitive learning theory (Bandura, 1977) together with the work of Folkman and Lazarus (1980) an interactional coping model has been constructed with illustrates the interaction between the environment, the carers' cognitive appraisal and their subsequent physical and emotional behaviour

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Mahoney D, Tennstedt S, Friedman R, Heeren T. An automated telephone system for monitoring the functional status of community-residing elders. Gerontologist 1999; 39(2):229-234. **USA** Massachusetts	Purpose was to test the validity and reliability of an automated telephone monitoring system by measuring functional status in community residing older adults and comparing the data with data gathered a) by a case manager during a home visit and (b by a telephone interviewer	Case control study (VI) SoE: Fair Criterion validity--the extent to which the same results as the gold standard are produced Reliability was evaluated using a test-retest design which measures the consistency of scoring over a short period of time when the participant's status has not changed Written informed consent obtained	The instruments used to measure functional disabilities were adaptations of the individual item ratings from the ADL and the IADL scales To assess test-retest reliability, the percentage of agreement between responses to the two TLC automated calls was calculated for each item of the ADL and IADL scales Weighted kappa statistics and 95% confidence interval were calculated for the combined set of ADL items and the set of IADL items	Convenience sample recruited from the client population of one Mass. home care agency 48 clients were contacted by phone 3 clients ineligible to participate 15 clients refused to participate n=30 participants agreed to participate mean age of clients in analytical sample was 78.9 years (range 61-98) 85% female all Caucasian	Intervention: Telephone Linked Communications (TLC) system Within a 72-hour period, each participant received in random order two automated and one personal telephone functional assessment as well as a home visit assessment by a case manager	48 participants originally contacted (41 women and 7 men) 3 clients ineligible to participate 15 refused to participate 30 agreed to and did participate Only 20 completed all four protocol components	Results indicated similarities between the personal and automated telephone assessments, but neither method captured as many impairments as the case manager's home assessment, and thus telephone assessment cannot substitute for a case manager's in home assessment TCL elder care system showed excellent test-retest reliability with a weighted kappa of 0.76 for the ADL items and 0.83 for the IADL itms
Markson LJ, Friedman RH, Jette AM, Kazis L. Computers as clinician extenders: monitoring chronic illness in elderly patients. International Journal of Technology and Aging 1992; 5(2):153-165. **USA**	To examine the role of computers as clinician extends for elderly patients	Descriptive study (VIII) SoE: Poor No original study design, but does review two pilot studies that were done to test the feasibility of using the TLC system to monitor anti-hypertensive therapy for elderly patients	None	None	None	None	Findings from the first pilot study reviewed suggest that having the computer check up on then weekly made them feel more secure or less worried about their illness; patients feel like active participants in their own medical care 2nd study reported findings suggest a number of modifications could be made to better adapt the system to various types of disabilities The two pilot studies reviewed suggest that the use of systems such as TLC may be feasible for many if not most elderly persons

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McGrew KB, Quinn CA. Examining the effectiveness of telephone assessment and care planning for homecare services. Generations 1997; 21(1):66-67. **USA**	To assess the effectiveness of telephone assessment and care planning for homecare services Elderly Services Program (ESP) is a homecare program designed to serve a moderately impaired older population who require a limited number of services to remain independent	Case controlled study (VII) SoE: Poor	No statistics reported Client satisfaction was measured using a fourteen question semi-structured interview exploring relationship between client expectations and objectives and the service package	n=40 Response rate approx. 50% Mean age of sample 76 years 69% female African Americans (55% of sample) were disproportionately represented	Two clinical researchers conducted face-to-face in-home assessments of forty ESP clients who had recently been assessed by telephone		High level of consistency between researcher (face-to-face) and agency (telephone) assessment in areas of financial and demographic data Differences between face-to-face and telephone assessment did not affect the case planning process or services received

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Montani C, Billaud N, Tyrrell J, Fluchaire I, Malterre C, Lauvernay N et al. Psychological impact of a remote psychometric consultation with hospitalized elderly people. J Telemed Telecare 1997; 3(3):140-145. **France** Grenoble	To evaluate the psychological impact of remote consultation in elderly patients Video consultations were compared with conventional ftf consultations	Case Control study (VII) SoE: Fair to Poor Video and ftf consultations consisted of a preliminary interview with a psychologist and 2 psychometric tests which evaluated the patients' cognitive function -- the Mini-Mental State Examination (MMSE) and the Clock Face Test (CFT)	Quantitative and qualitative data collected The duration of the two types of consultations were compared using t-tests Correlation (spearman's rho) between the patients' performances on each test in the two consultations Patients' scores from the two consultations were compared using a paired non-parametric test (Wilcoxon signed rank test)	n=15 geriatric hospital patients with no psychiatric history average age 88 years f=7 m=8 Exclusions: patients with serious visual or auditory defects 2 psychologists; 1 did tests and the other observed patients preference and attitudes for TM vs. ftf	4 month study The video consultation (6 mins) was significantly shorter than the conventional one (10 mins) Time taken to administer the psychometric tests (12 mins) was about the same in the two situations	15 participants enrolled. 1 refused to participate in part of the study	V/C method resulted in lower scores on MMSE (p=.003) and CFT (p = .07) 67% of patients preferred ftf consultation 40% of patients felt uncomfortable because of the screen and felt inhibited by the presence of the equipment Psychologists preferred ftf interviews Often difficult to hear and quality of image sometimes poor May have been a decline in concentration for patients in V/C method Patients participated more in ftf consultations

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Montgomery AA, Fahey T, Peters TJ, MacIntosh C, Sharp DJ. Evaluation of computer based clinical decision support system and risk chart for management of hypertension in primary care: randomized controlled trial. BMJ 2000; 320(7236):686-690. **UK** Avon	To investigate the effect of a computer based clinical decision support system and a risk chart on absolute cardiovascular risk, blood pressure, and prescribing of cardiovascular drugs in hypertensive patients	Cluster RCT (II) SoE: Good Neither patients nor physicians were blinded	Stata Statistical software used Descriptive statistics used for baseline comparability of groups Multivariate regression models Corrected for clustering using procedures in Stata Tested for an interaction effect of baseline risk level and trial arm Chi square and multinomial logistic regression	27 general practices recruited and randomly allocated Groups 1. Computer based clinical decision support system plus chart n=10 practices) n=269 eligible patients n=229 attend at baseline n=202 attend at 12 month follow up 2. Chart only (n=10 practices) n=264 eligible patients n=228 attend at baseline n=199 attend 12 month follow up 3. Usual care patients (n=7 practices) n=182 eligible patients n=157 attend baseline n=130 attend 12 month follow up Age of patients was between 60 and 79 years with high blood pressure	Patients were randomized to computer based clinical decision support system plus cardiovascular risk chart, or cardiovascular risk chart alone, or usual care	Of 810 randomly selected patients, 95 were excluded before invitation (non ambulatory patients and those with life threatening illness) A further 101 failed to attend the baseline consultation Of the remaining 614 patients, 552 and 531 attended the six and 12 month follow up respectively	Patients in the computer based clinical decision support system and chart only groups were no more likely to have cardiovascular risk reduced to below 10% than patients receiving usual care In terms of the percentage of patients with a five year cardiovascular risk greater than 10% neither the computer based clinical decision support system plus chart or chart alone were any better than usual care The results do not support the use of this computer based clinical decision support system in the management of hypertension The benefits of computers are clearer when they are used as administrative aids for detection, registration, and recall

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Neafsey PJ, Strickler Z, Shellman J, Padula AT. Delivering health information about self-medication to older adults: use of touchscreen-equipped notebook computers. J Gerontol Nurs 2001; 27(11):19-27. **USA**	Describes the development and pilot evaluation of a computerized drug interaction education program installed on a notebook computer equipped with a touch screen Personal education program (PEP) delivered to older adults	RCT (II) SoE: Good Pilot project PEP hypotheses tested in pilot study were: Participants using PEP will show greater knowledge of potential interactions of prescription meds with OTC medications and alcohol than will non-users Users of the PEP will show greater self-efficacy for avoiding drug and alcohol interactions than will non-users	SPSS used for statistical analysis Four instruments used to measure outcomes were developed and validated: -a self report measure of prescription of OTC drug and alcohol use -a measure of self-efficacy -an objective test to measure knowledge -a satisfaction instrument	Two focus groups of six people each evaluate PEP components ie.elements of software before RCT began n=60 total participants in RCT Experimental group n=30 mean age 73 years Control group n=30 mean age 68.8 years Both groups 88% women Sample randomly divided Various inclusion/exclusion criteria of participants mentioned ie.participants must be over age of 60 years	Experimental group was tested post-use of PEP Control group was also given the opportunity to use PEP but they were tested pre-use Pre and post scores were compared.	All 60 participants completed the study	Hypothesis 1: PEP group had significantly greater knowledge of potential interactions of prescription medications with OTC medications and alcohol than the control group Hypothesis 2: PEP group had significantly greater self-efficacy for avoiding drug and alcohol interactions than control group No significant difference in the overall mean satisfaction scores between the groups, but both groups were satisfied Participants noted they learned a lot study found important indications of knowledge and behaviour changes
Persson M, Mjorndal T, Carlberg B, Bohlin J, Lindholm LH. Evaluation of a computer-based decision support system for treatment of hypertension with drugs: retrospective, nonintervention testing of cost and guideline adherence. J Intern Med 2000; 247(1):87-93.	To evaluate a computerized decision support system (DSS) for drug treatment of hypertension, regarding quality, safety and cost compared to actual antihypertensive drug treatment	Descriptive (VIII) SoE: Poor		A list of hypertensive patients was extracted from the computerized medical records of each health centre (from four centres in Sweden) and every fifth patient's medical profile was assessed by the team n=338	The medical profiles of 338 hypertensive patients treated with drugs against hypertension were processed by the DSS. The drug treatment proposed by the system was then compared to actual treatment given by the physician	consistent	Using DSS suggests total cost reduction of 33-40% depending on doses chosen The DSS drug profile was more adherent to guidelines in patients with major complicating diseases, suggesting an improvement in treatment quality for these patients by the DSS

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Pringle Specht JK, Wakefield B, Flanagan J. Evaluating the cost of one telehealth application connecting an acute and long-term care setting. J Gerontol Nurs 2001; 27(1):34-39. **USA**	Cost analysis in a chronic wound consultation clinic	Descriptive study (VIII) SoE: Poor Pilot study	Cost analysis Three measures of cost avoidance were used in the study: consultant travel time, transporting the long-term care patients to the acute care setting for clinic appointments, and average time patients were gone from the facility	Not reported	Fifteen telehealth consultations per month were used to determine per consultation costs for line charges and depreciation/maintenance costs	Not reported	In the pilot study, the average cost of a telehealth chronic wound consultation was $136.16 compared to $246.28 if the patient had been transported and seen in the traditional face to face consultation
Riegel B, Carlson B, Kopp Z, LePetri B, Glaser D, Unger A. Effect of a standardized nurse case-management telephone intervention on resource use in patients with chronic heart failure. Arch Intern Med 2002; 162(6):705-712. **USA** California	To assess the effectiveness of a standardized telephonic case management intervention in decreasing resource use in patients with chronic heart failure	RCT (II) SoE: Good Patients were assigned to groups on the basis of which group their physician was randomized to	Intervention and usual care groups assessed for balance on demographic and clinical characteristics at baseline SPSS Covariates were used in the analyses if group differences were evident at baseline Cost analyses were conducted using logarithmically transformed data because of the severe positive skewness caused by multiple zeros Descriptive stats Multiple linear regression	Patients were identified at hospitalization and assigned to receive 6 months of intervention or usual care based on the group to which their physician was randomized Intervention group n=130 Usual care group n=228 Overall sample mean age 72 years and 51% female A total of 281 physicians were randomized, and none were told what group they were randomized to Differences between patients included: -difference between the subsample of 242 patients and the 116 on whom outpatient resource data use were not available as primary language -Differences between groups on demographic or clinical descriptions were a higher use of B-blockers and a lower incidence of chronic lung disease in the intervention group	Intervention group n=130 was telephoned within 5 days after hospital discharge and thereafter at a frequency guided by the software and case manager judgment Patients received an average of 17 phone calls at decreasing levels of intensity, length, and frequency over the 6-month follow up Each patient was estimated to have an average of 16 hours of a case manager's time overall Care for patients in the usual care group n=228 was not standardized. No formal telephonic case management program was used.	Final sample of n=358 patients (130 intervention and 228 control) were used for the analysis of acute care resource use Data on outpatient resource use and satisfaction were only available on a subsample of 242 patients; (intervention 130 and control 112)	Acute care resources use was consistently lower in the intervention group than in the usual care group at 3 and 6 months All-cause hospitalization rates dropped 25.6% at 3 months and stayed 28.2% lower in the intervention group at 6 months Heart failure remission rates were 36% lower in the intervention group at 3 and 6 months Significant cost savings found

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Roush RE, Teasdale TA. Reduced hospitalization rates of two sets of community-residing older adults after use of a personal response system. Journal of Applied Gerontology 1997; 16(3):355-366. **USA, Canada**	This study replicated a Canadian study done to determine whether use of a 24-hour personal response system (PRS) affected selected hospital utilization rates among community residing elders	2 studies: 1) Cohort study (VI) 2) Descriptive study (VIII) - comparison of US and Canadian programs Overall SoE: Fair All persons who subscribed to the Lifeline Program PRS of Tallahassee Medical Centre for at least one full year between 1991 through 1993 were identified (n=101) Hospital data were charted for 1 year prior to and 1 year after initial subscription to the program Comparison to 106 PRS subscribers in Canada	Statistical analyses included a description of the Tallahassee data and a comparison of known demographic features and hospital utilization rates before and after PRS use	n=101 Age range 36-93 years Mean age 76.5 years 87% females Comparisons were done between Tallahassee and Langley Lifeline Program PRS subscribers -no substantive difference in mean age found -Tallahassee sample had slightly higher number of female subscribers -mean number of ED visits prior to subscription was significantly greater in the US sample when compared to the Canadian sample	No intervention. Utilization data from patients subscribed to the Lifeline Program were taken for 1 year prior and 1 year following their subscription.	Not reported	Emergency department visits decreased slightly during the subscribers' first year of PRS use, but the drop was not statistically significant Average reduction of days of hospitalization per subscriber per year was statistically significant
Sanz F, Silveira C, Alonso A, Diaz C, Loza MI, Cordero L et al. Telematics applications to support the role of the community pharmacists as self-medication advisors. TESEMED Consortium. Stud Health Technol Inform 1999; 68:764-767.	To examine programs developed for the info and training of community pharmacists with the aim to empower them as advisors of the citizens about self medication topics	Descriptive (VIII) SoE: Poor TESEMED and TEEMED-II are research projects funded in Europe Pharmacists not involved in the development given q'aires to ask about their opinions ie. re:usefulness	Respondents rated on likert scale ie.usefulness of program	n=84 pharmacists Mean age 41.2 years sd 11.6 years m=34 f=48 gender not recorded=2		All participants completed the study	High percent of respondents (81%) answered "probably" or "for sure" to the question: "Do you think that a program like this would improve your knowledge and skills in treating the minor ailment covered?"

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Scalvini S, Zanelli E, Domenighini D, Massarelli G, Zampini P, Giordano A, Glisenti F. Telecardiology community: a new approach to take care of cardiac patients. Cardiologia 1999; 44(10):921-924. **Italy**	To report on the preliminary data collected over the first 6 months of a telecardiology service.	Non controlled clinical series (VIII) SoE: Poor Looks at frequency of call, and the resulting diagnosis and treatment resulting from the calls.	None mentioned.	Practitioners in two north Italian provinces. Average age of participants 63 years 44% m 56%f	From February to July 1998, the general practitioners received a portable Card Guard 7100 electrocardiograph transferring, by mobile or fixed telephone, a 12 lead ECG to a receiving station, where a cardiologist was available for the reporting and interactive teleconsultation. The cardiologist then recorded his intervention: action not taken, referral to casualty, request for further investigations, start of new treatment, or treatment modifications.	n=178 general practitioners. 2800 calls were received.	Overall the cardiologists reported no action in 74% of the patients (n=1667), while for the remaining 578 patients there were several suggestions given (such as request for further diagnostic tests as an out-patient, altering medication, or new treatment).

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Shah NB, Der E, Ruggerio C, Heindereich PA, Massic BM. Prevention of Hospitalizations for heart failure with an interactive home monitoring program. Am Heart Journal 1998; 135:373-8. **USA**	A pilot study to determine whether a less intensive program with patient education materials, automated reminders for medication compliance, self-monitoring of daily weights and vital signs, and facilitated telephone communication with a nurse could reduce hospitalizations and whether this benefit could be extended to younger outpatients	Non-controlled clinical series (VIII) SoE: Poor Participants in the study were drawn from patients admitted with the diagnosis of congestive heart failure (CHF) or those referred to the Heart clinic in San Fran over the 6 month period between December 1994 and May 1995	Primary efficacy end point of the study was the number of hospitalizations and hospital days during the follow up period compared with the same time period before entrance into program Wilcoxon's sign rank test used for statistical analysis	n=27 patients enrolled mean age 62 years all male	Patients followed program for 1 year Mean length of follow-up period was 8.5 months All patients were mailed at weekly intervals educational materials for the initial 8 weeks Patients also given a pager which was used to transmit computer generated reminders to the patient to take medications, weigh themselves, and measure BP and heart rate Patients were contacted by phone once a week by the nurse, and patients were given 24 hour telephone access to a nurse if needed Information from patient passed on to physician once a month	Four patients died during the course of follow up	The number of hospitalizations per patient-year of follow up after enrollment was 0.4 compared with 0.8 per patient-year during the equivalent period before enrollment During the study there were 52 physician notifications by the monitoring service for 65 reported problems (weight gain, shortness of breath, fatigue, and other symptoms of CHF). There were 19 physician interventions from these notifications. Patient satisfaction with program was rated as very high; physicians found the program helpful The reduction in hospitalization was most evident among patients with more severe CHF

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Shea S, Starren J, Weinstock RS, Knudson PE, Teresi J, Holmes D et al. Columbia University's Informatics for Diabetes Education and Telemedicine (IDEATel) Project: rationale and design. J Am Med Inform Assoc 2002; 9(1):49-62. **USA**	Columbia University Informatics for Diabetes Education and Telemedicine (IDEATel) Project is a four year demonstration project with the overall goals of evaluating the feasibility, acceptability, effectiveness, and cost-effectiveness of telemedicine in the management of older patients with diabetes	Cannot evaluate the strength of evidence as the study has not yet been completed Proposed design for study Randomized control trial that is being conducted by a state-wide consortium in New York Technical component of intervention frozen at start of the trial	Analysis has not yet been performed	Total n=1500 participants Telemedicine group n=750 Control group n=750 Half of participants from urban component and other half from rural Population of the urban area predominantly Hispanic and African American Population of the rural area mostly non-Hispanic white Participants must have diabetes mellitus and live in a federally designated medically undeserved area	2 yr project -Intervention grp gets home telemedicine unit that provides synchronous v/c with a project based nurse, electronic transmission of home fingerstick glucose and BP data, and web access to a project web site -It is hypothesized intervention will improve patient outcomes: more frequent interactions between patients and providers will enable patients to initiate more rapid behaviour changes as well as changes in their treatment regimes without an office visit; closer monitoring of glucose, BP will be coupled with quicker feedback from the provider; improve education for patients	Not completed	Study still ongoing Main study outcomes are noted to be glycosylated hemoglobin level, blood pressure level, and cost of care Secondary outcomes include lipid levels, smoking, quality of life, and patient satisfaction

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Starren J, Hripcsak G, Sengupta S, Abbruscato CR, Knudson PE, Weinstock RS et al. Columbia University's Informatics for Diabetes Education and Telemedicine (IDEATel) project: technical implementation. J Am Med Inform Assoc 2002; 9(1):25-36. **USA**	Informatics for Diabetes Education and Telemedicine (IDEATel) project is s four year demonstration project with the overall goal of evaluating the feasibility, acceptability, effectiveness, and cost effectiveness of telemedicine	Study ongoing will be an RCT Focal point of the intervention is the home telemedicine unit (HTU) which has 4 critical functions: -videoconferencing -medical data acquisition through an electronic device interface -secure web-based access to clinical data and messaging -web-based access to tailored educational materials	None	Plan to recruit 1500 elderly diabetic patients who live at home in a "medically undeserved area" or "health professional shortage area"	None	None	No findings have yet been reported study ongoing
Stiles N, Boosalis M, Thompson K, Stinnett D, Rayens MK. Nutrition telemedicine consultation for rural elders. Journal of Nutrition for the Elderly 1998; 18(1):47-55. **USA**	Pilot study to assess the feasibility of nutritional assessment and treatment using telemedicine for elderly patients needing nutritional info	Non controlled clinical series (VIII) SoE: Poor Pilot Study Nutrition consultant interviewed each participant via full motion compressed video (V-TEL) After completion of nutritional assessment, consultant identified any nutritional concerns and made recommendations to participants	Immediately following the telemedicine consultation, participant and consultant completed standardized q'aires about the experience using a 7 point likert scale	n=20	Interventions were telemedicine consultations lasting an average of 48 minutes (range 37-75, sd=9.65)	No follow-up	Both participants and consultants reported an overall very positive experience Info obtained during telemed interview was sufficient to identify nutritional concerns in all participants and make dietary recommendations

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Strawn BD, Hester S, Brown WS. Telecare: a social support intervention for family caregivers of dementia victims. Clinical Gerontologist 1998; 18(3):66-69. **USA**	This study examined the utility of a telephone intervention to provide support and assistance to caregivers of individuals with progressive dementia	Non-controlled Clinical Series (VIII) SoE: Fair-Poor Within subjects baseline treatment design	Assessments were done at two pre-Telecare baseline times, at midpoint and at endpoint, as well as at a 2 week post intervention follow-up 5 assessments in caregivers' homes consisted of a demographic interview, the Brief Symptom Inventory (BSI), and the Burden Interview (BI) ANOVA	n=14 caregiver participants	Duration 12 weeks Mean number of days between telecare contacts was 8.8 and the mean number of telecare contacts made was 11.8 Telecare intervention consisted of weekly telephone contacts from a caring caller (CC)	2 week post intervention follow-up	Baseline period suggested a trend toward increasing psychological distress and symptomatology but a significant reduction in overall stress related responses was evident during the treatment period Decreases in perceived burden also found Caregivers highly valued telecare
Subirana Serrate R, Ferrer-Roca O, Gonzalez-Davila E. A cost-minimization analysis of oncology home care versus hospital care. Journal of Telemedicine and Telecare 2001; 7:226-232. **Spain**	To compare the cost of telephone-supported home care to inhospital care for elderly oncology patients	Non randomized controlled trial (IV) SoE: Fair 2 groups n=10 patients in control group (hospital care) n=10 in test group (home care) Home medical attention included home visits and 24 hour support from a doctor or other health care professional	Cost comparison was based on the variable costs paid by insurance companies Expenses divided into: costs derived from medical doctors and nurse team support; costs linked to lab and radiology exams; costs linked to palliative therapy or chemo Statistical comparisons used Student's t-test and chi-square	n=20 total oncology patients Home group (prospective) n=10 m=7 f=3 age range 54-84 years Control group (retrospective) n=10 m=7 f=3 age range 47-75 years	Jan - Oct 1997 Home care group received 2 types of service: (A1) home visits and 24 h telephone support from the doctor on call (A2) home hospitalization" = hospital-like care from a specialized nurse team dispensing specific tx (e.g., chemotherapy, parental feeding, intravenous tx, blood transfusions, pain tx, functional rehabilitation) 6 patients received A2 only and 4 received both Control group received (B1) outpatient and (B2) inpatient care. 3 patients received B2 only and 7 received both		The cost-minimization analysis showed significant cost savings for oncology patients nursed at home with telephone support, with a reduction in treatment costs and the number of home visits

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Tang WK, Chiu H, Woo J, Hjelm M, Hui E. Telespsychiatry in Psychogeriatric Service: A Pilot Study.International Journal of Geriatric Psychiatry, 2001; 16: 88-93. **China** Hong Kong	Telepsychiatry is a new development in Hong Kong and article discusses the feasibility, acceptability, costs, benefits and limitations of telepsychiatry	Cohort Study (VI) SoE: Fair Pilot Study	Patient and provider questionnaires Cost comparison of V/C vs. on-site visits Psychiatrist (using estimates)	All elderly residents who had received psychiatric assessments in the study period were included 149 psychiatric consultations applicable to the 45 patients m=13 f=32 mean age 84.1 years - both dementia and non dementia patients 8 new case assessments, and the rest were follow-up	V/C link between a hospital and a geriatric care and attention home for patient assessment From August 1998 to June 1999 total of 1001 teleconsultations and of these 149 were psychiatric consultations	Some patients received follow up on their consultations	Videoconferencing was found to be a suitable alternative covering the vast majority of existing services, including urgent consultations Psychiatrist found V/C useful, but patients and nursing staff found it less favourable
Townsend CH, Maxwell W, Sears LT. Nurse practitioner patient centered telephone calls in a VA primary care geriatric clinic. Journal of the American Academy of Nurse Practitioners 1997::269-275. **USA**	To present original research of a retrospective study of telephone calls by nurse practitioners (NP) to geriatric primary care patients over the period of one year in a Veteran's Administration primary care clinic in the southeast.	Descriptive study (VIII) SoE: Poor Retrospective study, exploratory chart review and card-sort methods were used for data collection and analysis.	Every telephone call progress note was listed on an individual index card, along with who prompted the telephone call and the reason (subject) of the telephone call. These cards were then sorted into two piles; NP generated telephone calls and non-NP generated phone calls. They then made separate reason cards, and then they were sorted into categories to better identify the types of telephone calls.	The hospital is mainly used by veterans, and they are primarily male, WW two veterans or Korean veterans. They were 65 or older. Convenience sample of electronic patient progress notes labeled "telephone call".	Intervention was not really used. Study was a retrospective chart review.	Patient progress notes were collected from May 1, 1998 through to April 30, 1999.	

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Wagner MM, Hogan WR. The accuracy of medication data in an outpatient electronic medical record. J Am Med Inform Assoc 1996; 3(3):234-244. **USA** Pittsburg, PA	To measure the accuracy of medication records stored in the electronic medical record (EMR) of an outpatient geriatric centre The authors analyzed accuracy from the perspective of a clinician using the data and the perspective of a computer-based medical decision-support system (MDSS)	Prospective cohort study (VI) SoE: Fair	The EMR at the geriatric center captures medication data both directly from clinicians and indirectly using encounter forms and data entry clerks. During a scheduled office visit for medical care, the treating clinician determined whether the medication records for the patient were an accurate representation of the meds that the patient was actually taking. Using the available sources of info, the clinician determined whether the recorded data were correct, whether any data were missing, and the type and cause for each discrepancy found	Original number of patient visits during 3 week study n=208 Total number of patients included in study n=117	No intervention 3 week study period	Of the original 208 visits that met the inclusion criteria 91 were excluded, various reasons cited	Principle result of this study is the demonstration of moderately high levels of error in the medication records of an EMR Second result is that the main causes of error are problems in the capture of medication data, not problems with the accurate entry of data Direct entry of data by clinicians may produce improvements in data accuracy

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Wasson J, Gaudette C, Whaley F, Sauvigne A, Baribeau P, Welch HG. Telephone care as a substitute for routine clinic follow-up. [see comments]. JAMA 1992; 267(13):1788-1793. **USA** Vermont	Examined the hypothesis that substituting clinician-initiated telephone calls (telephone care) for some clinic visits would reduce medical care utilization without adversely affecting patient health	RCT (II) SoE: Good Compares telephone care with ftf visits Blinding of patient & provider not feasible Balance randomization strategy: patients were randomized within each provider panel, such that individual providers cared for equal numbers of telephone-care and usual-care patients	Patients were randomized and providers served as their own controls Demographic and utilization differences between study groups were compared using chi square and Wilcoxon's rank-sum test Changes in health and satisfaction were compared using ANOVA Medical care charges between these two groups were compared using Wilcoxon's rank-sum test and linear regression Logistic regression was used to adjust for potential differences in mortality between the study groups	14 members of the permanent medical staff n=497 patients consented to participate Telephone care group n=249 mean age 66 years all men Usual care group n=248 mean age 66 years all men Randomization resulted in comparable patient groups	Control group patients were scheduled to see the same provider at the recommended interval (e.g., "return in 3 mo.") For patients randomized to receive telephone care, the recommended interval was doubled (e.g., "return in 3 mo." translated to "return in 6 mo.") and 3 telephone contacts were scheduled at standard intervals between visits Approx. 8 telephone calls were made to each telephone care patient during the 2 year study period (total 1639 calls)	After 24 months of follow up n=218 telephone care patients still participating and n=216 usual care patients n=28 died Patient q'aires re. satisfaction with access were completed at baseline and completion of study	Telephone care significantly reduced clinical visits, use of medications and chemistry tests, medication use, and the duration of both hospital and intensive care unit stays Although similar proportions of patients were hospitalized in each group, telephone care patients had fewer hospital days Total charges (P=.05), outpatient charges (P=.02) and inpatient charges (P=.006) were lower for the telephone-care group. After controlling baseline scores the two study groups had the same average change in satisfaction with provider continuity, perceived access, and quality of care
Weinberger M, Nagle B, Hanlon JT, Samsa GP, Schmader K, Landsman PB et al. Assessing health-related quality of life in elderly outpatients: Telephone versus face-to-face administration. Journal of the American Geriatrics Society 1994; 42(12):1295-1299. **USA** North Carolina	Comparison of telephone and face to face administration of the SF-36, a health-related quality of life (HRQOL) measure	Case control(VII) SoE: Poor ftf interviewers were blinded to the results of the telephone interviews (a RCT related to an in-person pharmacy visit during general medicine visit is also described; however, results from this aspect of the study are not mentioned in detail in the article. It is the substudy following the 1-year RCT that is the focus of this article).	HRQOL was assessed with the SF-36 Characteristics of eligible sub study patients who did and did not participate were compared using t tests and chi square statistics Completion time for telephone versus ftf administration was compared using a t test	There were 42 eligible participants following the 1-year RCT n=31 elderly outpatients enrolled average age 68.5 yrs all male All participants had been prescribed multiple medications 1 telephone interviewer (clinical pharmacist) 3 ftf interviewers (1 research nurse, 2 other clinical pharmacists)	subjects received a telephone interview by a clinical pharmacist which included administration of the SF-36 subjects were then administered the SF-36 by a ftf interviewer within 30 days of the telephone interview	not clear why 11 patients were not enrolled	Telephone administration of SF-36 took less time than ftf Substantial, nonsystematic discrepancies in telephone vs. ftf scores for all eight SF-36 scales No conclusions about which mode of administration is more valid, and study did not determine whether the findings should be attributed to differences in the mode of administration or to instability of subjects' responses over a short time (mean=16.7 days)

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Author / Title / Journal / Year / Country / Location	Purpose/ Objectives	Design	Analysis	Participants: age/ gender/ groups	Intervention/ Duration	Follow-up: sample size; dropout	Outcomes/ Socio-Economic Indicators
Welch HG, Johnson DJ, Edson R. Telephone care as an adjunct to routine medical follow-up. A negative randomized trial. Eff Clinic pract 2000; 3(3): 123-130. **USA** Colorado, South Dakota	In a previous year a randomized trial at one outpatient clinic demonstrated that making telephone appointments part of routine medical follow-up could save money and reduce hospitalization The objective of this study is to ascertain the effects of telephone care in other clinics	RCT (II) SoE:Good Pilot study conducted at two veterans affairs medical clinics from 1995-1998 First is the intake visit where patient has routine visit after which the provider recommends revisit interval (ie. return in three months) Participants then randomly assigned to the telephone care group or the usual care group Using a balanced randomization scheme, authors were able to ensure that each provider cared for a similar number of telephone and usual care patients and thus acted as his or her own control	Patients were analyzed in the group to which they were randomly assigned Simple parametric (chi-square and t-tests) and nonparametric (Wilcoxon rank-sum) methods were used to compare patient characteristics, process and intervention monitoring, patient health status, patient health care utilization, and satisfaction with medical care and telephone care	n=512 patients entered into the study 27 patients died in the ensuing 2 years (13 telephone care and 14 usual care patients) Additional 24 patients were lost to follow-up (8 telephone care and 16 usual care) Complete follow up available for 461 patients Random assignment of patient into 2 groups: Telephone care group n=257 patients mean age=68.3 years 97% male Usual care group n=255 patients mean age =68.7 years 98% male	In the telephone care group the recommended revisit interval was doubled (e.g. to 6 months) and three telephone appointment were scheduled at 0.25, 0.75, and 1.5 times the originally recommended interval (e.g. 3, 9, and 18 weeks) Another three telephone appointments were scheduled at each subsequent visit until the end of 2 yr FU In the usual care group the recommended revisit interval was not altered and no telephone calls were scheduled Over 2000 telephone calls were made to telephone care patients over the 2 year period, an average of about 9 calls per patient	n=51 patients dropped out during 2 year study Telephone call follow up	Negative findings overall Intervention had little effect on -self assessed health status -provider assessed health status -health care utilization Overall patient satisfaction did not change during the 2 year period in either group Telephone care patients were significantly more likely than usual care patients to believe that telephone calls could be an important component of medical care Overall failure to replicate the findings of the original telephone care study, but authors have no obvious explanation

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Author / Title / Journal / Year / Country / Location	Methodological Problems	Policy Recommendations	Applicability to Alberta
Ames D. Psychiatric diagnoses made by the AGECAT system in residents of local authority homes for the elderly: Outcome and diagnostic stability after four years. International Journal of Geriatric Psychiatry 1992; 7(2):83-87. Australia	Very high dropout rate (71%) Absence of an AGECAT "well" comparison group Lack of blind follow up	The AGECAT system is an important development in psychiatric epidemiology and a satisfactory performance in the diagnosis of the common syndromes of dementia and depression is essential to its future The high death rate found among these elderly subjects after 4 years indicates that future investigators studying AGECAT outcomes should select samples more representative of the age range of the total elderly population and reinterview their subjects earlier	
Anderson JL, Gilbert EM, Alpert BL, Henthorn RW, Waldo AL, Bhandari AK et al. Prevention of symptomatic recurrences of paroxysmal atrial fibrillation in patients initially tolerating antiarrhythmic therapy. A multicenter, double-blind, crossover study of flecainide and placebo with transtelephonic monitoring. Circulation 1989; 80(6):1557-1570. USA	Various limitations of study noted ie.study design does not allow determination of a minimum effective drug dose	Careful risk/benefit ratio assessment needed before considering the use of flecainide in PAF Transtelephonic monitoring is a useful method for documentation of the occurrence of paroxysmal arrhythmia's such as PAF	

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Anon. Solid outcomes show e-heath and chronically ill senior populations are compatible. Disease Management Advisor 2001; 7(7):103-106. **USA**	Control group much smaller; no results given on control group No tests to determine statistical significance	May be cost effective	
Ball C, Tyrrell J, Long C. Scoring written material from the Mini-Mental State Examination: a comparison of face-to-face, fax and video-linked scoring. J Telemed Telecare 1999; 5(4):253-256. **France, UK**	inter-rater reliability not discussed	Need for further studies of the different forms of cognitive testing to determine their reliability when administered by video-link Where the criteria for scoring are relatively loose and the examiner may use other clues from the task as is the case with sentences, then using fax machines or simple V/C tools allows for reliable scoring. When the rules are tighter, V/C may not be a very reliable method	Some psychometric tests are used on a limited basis in Alberta over v/c technology including the MMSE. This study confirms reported clinican experience with respect to administration of the interlocking pentagons question in MMSE over video. It supports the need for validation of psychometric tests over v/c for not only geriatric clients but others as well.

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Author / Title / Journal / Year / Country / Location	**Methodological Problems**	**Policy Recommendations**	**Applicability to Alberta**
Berkman P, Heinik J, Rosenthal M, Burke M. Supportive telephone outreach as an interventional strategy for elderly patients in a period of crisis. Social Work in Health Care 1999; 28(4):63-76. **Israel**	Questionable mental status of some patients (some patients did not know a war was going on) Not all calls taken by the patient, other respondents included family members and the maid No control group who did not receive telephone calls Methodologically poor	Despite the methodological problems, it is possible that telephone support to elderly persons during a time of crisis is a readily applicable therapeutic tool	

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Bondmass M, Bolger N, Castro G, Avitall B. The effect of home monitoring and telemanagement on blood pressure control among African Americans. Telemedicine Journal 2000; 6(1):15-23. **USA**	No control group Generalization of results not possible as results only apply to cohort studied Research utilizing a randomized design is needed to validate the system and the method's true potential	The general cardiovascular health of African Americans is relatively poorer and has not improved as much over the past decades compared with that of Caucasians and Hispanics. More cardiovascular research is needed with interventions specifically focused on African Americans	
Bratton RL, Short TM. Patient satisfaction with telemedicine: a comparison study of geriatric patients. J Telemed Telecare 2001; 7 Suppl 2:85-86. **USA**	Volunteers used as participants No control group No analysis completed		

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Author / Title / Journal / Year / Country / Location	**Methodological Problems**	**Policy Recommendations**	**Applicability to Alberta**
Brennan PF, Moore SM. Networks for home care support: the ComputerLink project. Caring 1994; 8(8):64-66. **USA** Cleveland, Ohio	Project is limited in that it employs only behaviours as evidence of collaboration No results given from comparison group. No comparison of experimental & control groups. No clinical outcomes	CompuerLink is a valuable vehicle for promoting collaboration for caregivers of persons with AD It facilitates peer communication and fosters collaboration among caregivers Sense of control for caregivers in having access to peer support Fosters collaboration with professionals This work has primary relevance for informatics specialists and for researchers and clinicians interested in supporting caregivers with the task of caring for one with AD May also be useful information for other home care populations	
Cameron K, Hughes K, Doughty K. Reducing fall incidence in community elders by telecare using predictive systems. Proceedings of the 19th IE EE Engineering in Medicine and Biology Society Conference 1997; 3:1036-1039. **UK**			

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Author / Title / Journal / Year / Country / Location	**Methodological Problems**	**Policy Recommendations**	**Applicability to Alberta**
Carroll DL, Robinson E, Buselli E, Berry D, Rankin SH. Activities of the APN to enhance unpartnered elders self-efficacy after myocardial infarction. Clinical Nurse Specialist 2001:60-66. **USA**	No mention of how the participants were chosen, or what their "baseline" was before the intervention (ie. Possible co-morbidities, level of functioning)	Referral to cardiac rehabilitation programs should also be emphasized as these programs offer not only nursing and medical surveillance, but also provide an important social support mechanism. The APN coached intervention is a cost-effective low-technological way to extend specialized nursing services to unpartnered elders post-myocardial infarction.	

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Castro CM, King AC, Brassington GS. Telephone versus mail interventions for maintenance of physical activity in older adults. Health Psychol 2001; 20(6):438-444. **USA**	No control group in year 2; year 1 results not reported -Selection bias possible, as only those who were more successful in the adoption phase were more likely to continue into a maintenance program -Sample primarily Caucasian and well educated and thus cannot be generalized -Multiple exclusion criteria	Given that patients in the high intensity category showed a more gradual decline in activity, programs that promote fewer days of physical activity at a somewhat higher intensity level may be more optimal for maintaining longer term activity in older adults Programs like those described in this study could be cost-and program-effective methods for health care providers, private health care organizations, and public health promotion agencies (ie. Heart Association) to promote long term physical activity participation in communities	
Chan M, Bocquet H, Campo E, Val T, Esteve D, Pous J. Multisensor system and artificial intelligence in housing for the elderly. Stud Health Technol Inform 1998; 48:145-149. **France**			

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Coogle CL, Osgood NJ, Parham IA, Helen E, Churcher CS. Effectiveness of videoconferencing in geriatric alcoholism education. Gerontology and Geriatrics Education 1995; 16(2):73-83. **USA** Virginia	No real statistical analysis done in study Study participants heavily weighted to providers Delivery of the same information to various types of people may leave some unable to understand material presented	Single outreach message may educate various types of people all at once	There is a network of nearly 200 v/c sites (in operation or planned for implementation) that has only rarely been used for client and family education sessions. This article speaks to the potential to use v/c for this purpose.
De Leo D, Carollo G, Dello BM. Lower suicide rates associated with a Tele-Help/Tele-Check service for the elderly at home. American Journal of Psychiatry 1995; 152(4):632-634. **Italy**	differences between study group (persons aged 65+) and comparison group (general population) Utilization of service not reported		

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Author / Title / Journal / Year / Country / Location	Methodological Problems	Policy Recommendations	Applicability to Alberta
de Lusignan S, Wells S. Johnson P, Meredith K, Leatham E. Compliance and effectiveness of 1 year's home telemonitoring. The report of a pilot study of patients with chronic heart failure. Eur J Heart Fail 2001; 3(6):723-730. **UK**	Sample size too small Sample selection bias No statistical analysis, or any other analysis described	Hometelemonitoring is an acceptable and reliable intervention Benefit in terms of compliance of medication and self monitoring is still seen after one year Careful consideration needs to be given as to which patients will benefit most from this type of monitoring	In Alberta, telehome care has not yet been widely adopted. This study contribues to the evidence supporting telehomecare. Northwestern Health Services Region has recently purchased equipment for this purpose. There are presently outstanding questions with need for development of technical standards for this application.
Fowkes W, Christenson D, McKAy D. An analysis of the use of the telephone in the management of patients in skilled nursing facilities. JAGS 1997; 45:67-70. **USA**	Study analyzes only through medical provider. Only calls about nursing home residents examined.	Many states have regulations covering nursing homes that augment Medicare directives. This likely results in an increased call burden even for the most trivial of conditions. Serious problems are buried in the myriad of regulation-driven phone calls that are unnecessary and counterproductive. The adoption of this alternative would likely decrease the need for communication and enhance the quality of rendered care.	

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Friedman RH, Kazis LE, Jette A, Smith MB, Stollerman J, Torgerson J et al. A telecommunications system for monitoring and counseling patients with hypertension. Impact on medication adherence and blood pressure control. Am J Hypertens 1996; 9(4 Pt 1):285-292. **USA** Massachusetts	Generalizability of study findings to other hypertensive patients may be affected by features of study design and execution 1. Participants were 60 years of age or older, and therefore findings may not be applicable to younger patients	Found to be cost effective Use of TLC may reduce overall health services utilization and cost Use of TLC can reduce DBP in patients Might be reasonable to use a telecommunication system like TLC in the care of patients with hypertension to complement or substitute for some routine office visits	Interesting approach, could be compromised by existing Fee for Service Billing plan, probably most applicable to physicians compensated under alternative payment plans.
Fulmer TT, Hollander Feldman P, Sook Kim T, Carty B, Beers M, Molina M, Putnam M. An Intervention Study to Enhance Medication Compliance in Community-Dwelling Elderly Individuals. Journal of Gerontological Nursing, 1999; August: 6-14. **USA** New York	Small sample size Very low participation rate (approx. 10%) Monitoring bottle caps makes it easy for patients to remove the cap, but not take any medicine from the bottle Exclusion of patients who routinely relied on pre-poured medication		This article speaks to the merit of Alberta telehealth business cases including consideration of the simplest/most cost effective technology. Some already do this. For example, the Capital Health Authority Telehealth Business Plan template includes analysis of alternative approaches.

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Gallienne RL, Moore SM, Brennan PF. Alzheimer's caregivers: psychosocial support via computer networks. Journal of Gerontological Nursing 1993; 19(12):15-22. **USA** Cleveland, Ohio		Advantages of the provision of psychosocial support via this medium are: -social interaction among members permits options to be defined and opinions to be shared -anonymity -24-hour access to ComputerLink -messages of emotional and spiritual support and vital information are saved on the network and can be easily retrieved The support provided to caregivers through this network is very important considering that empathetic communication of this nature cannot happen in an office setting.	

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Go RC, Duke LW, Harrell LE, Cody H, Bassett SS, Folstein MF et al. Development and validation of a Structured Telephone Interview for Dementia Assessment (STIDA): the NIMH Genetics Initiative. J Geriatr Psychiatry Neurol 1997; 10(4):161-167. **USA**	Small sample size Level of motivation, anxiety, and education as well as listening conditions and auditory deficits may affect performance Telephone screening cannot substitute for ftf clinical evaluation in determining the causes of impaired performance	Information on change in functional status can be obtained over the telephone - functional status questions contribute useful assessment information beyond that obtained with cognitive testing alone The evidence of validity of both the full and the short STIDA at detecting cognitive impairment through telephone screening suggests that both instruments have utility as screens for detecting dementia	A limited number of psychometric tests have been validated for use via telehealth (phone and v/c). The short form of the STIDA is potentilly a useful tool for the provincial mental health help line which is slated for integration with the Health Link Service
Hegarty K, Byrne G, Del Mar C. A pilot study of computer-assisted screening for depression in the elderly in general practice. Informatics in Healthcare Australia 1996; 5(4):166-168. **Australia** Brisbane	Small n No measures of benefit / outcome Receptionists participated in study and had no training about study		

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Hunkeler EM, Meresman JF, Hargreaves WA, Fireman B, Berman WH, Kirsch AJ et al. Efficacy of nurse telehealth care and peer support in augmenting treatment of depression in primary care. Arch Fam Med 2000; 9(8):700-708. **USA** San Fransisco	Highly educated sample does not allow for generalization to non-educated sample Guidelines of those providing peer support unclear	Further research is needed to determine why nurse telehealth care is not superior to usual patient care in terms of increasing patients' adherence to their prescribed medication Findings of this study need to be replicated in other circumstances to judge how confidently a broad adoption can be recommended Nurse telehealth care improves clinical outcomes of antidepressant drug treatment and patient satisfaction and fits well within busy primary care settings	This article presents an augmentation to physician care for depression. The challenge is who would be responsible for delivery of the nurse telecare. Care of geriatric psychciatric patients in the community often falls to home care although other parties including mental health clinic staff, community geographic or outreach teams (eg Central Alberta Psychogeriatric Community Outreach Service). Divestiture of tch AMHB clinics to the health authorities may help in coordinating opportunities for this kind of intervention.

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Infante-Rivard C, Krieger M, Petitclerc M, Baumgarten M. a telephone support service to reduce medical care use among the elderly. JAGS 1988; 36:306-311. **Canada** Quebec		A telephone support service may not reduce the number of physician visits, but could affect factors which in turn affect utilization of care, such as a sense of security, contentment, and satisfaction with care.	

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Johnston D, Jones BN, III. Telepsychiatry consultations to a rural nursing facility: a 2-year experience. J Geriatr Psychiatry Neurol 2001; 14(2):72-75. **USA** North Carolina	No analysis reported	Recommendations for implementing psychiatry teleconsultation programs -interest and commitment from the remote facility is essential and must be developed through a process that identifies needs and priorities at the remote site -training and orientation to the equipment and the consultation protocol will improve efficiency and effectiveness -arrangements must be made for technical support of the equipment -equipment technical specifications such as band width must be taken into consideration TM services should be created in response to a legitimate need, be preceded by adequate training of personnel, and use the simplest equipment	
Johnstone HM. Quality outcomes of nursing tele-visits. George Mason University, 2000. **USA**	Primary limitation noted by the author is that the characteristics of the sample of interest were previously determined by criteria set forth in a federal telemedicine grant		

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Author / Title / Journal / Year / Country / Location	**Methodological Problems**	**Policy Recommendations**	**Applicability to Alberta**
Jones III BN, Johnston D, Reboussin B, McCall WV. Reliability of telepsychiatry assessments: subjective versus observational ratings. J or Geriatric Psychiatry and Neurology 2001; 14:66-71. **USA** North Carolina	Low cost equipment used Results would not be applicable to higher quality equipment Rater bias was present in that some clinicians rated higher on average than others Small sample size	V/C assessment of geriatric patients is a reliable method for examining mental status and behavior. V/C equipment, particularly low bandwidth systems, should be employed for clinical use only after consideration of the applicant, patient population, and image quality of the system Federal regulations for TM reimbursement do not specify requirements in terms of video technology or clinical accuracy. Professional organizations need to articulate the clinical standards for TM in special populations such as geriatric psychiatry.	
Lyketsos CG, Roques C, Hovanec L, Jones BN, III. Telemedicine use and the reduction of psychiatric admissions from a long-term care facility. J Geriatr Psychiatry Neurol 2001; 14(2):76-79. **USA** Maryland	no clinical measures no experimental control	TM program brought about a shift in perspective. The clinical teams in each organization, although distinct, became part of a whole and together comprised an effective continuum of care	

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Macduff C et al. Telemedicine in rural care. Part 2: assessing the wider issues. Nursing Standard 2001; 15(33): 33-37. **UK**	Not an empirical study, and cannot determine if the discussion of results are based on an empirical study.	Queries whether telemedicine; that is, it is wrong to assume that telemedicine is necessarily a benefit to nurses. Because of this, there are some procedural and professional change issues for consideration, such as organization and how the concept is introduced to the user. Professional issues relate to individual involvement, and effect on scope of practice, colleagues, competence, autonomy and performance.	
Magnusson L, Berthold H, Brito L, Chambers M, Daly T, Emery D. ACTION: assisting carers using telematics interventions to meet older person's needs. Nursing informatics: the impact of nursing knowledge on health care informatics. Proceedings of NI'97, Sixth Triennial International Congress of IMIA-NI, Nursing Informatics of International Medical Informatics Association. Amsterdam, Netherlands: IOS Press, 1997: 551. **Europe**	No analysis or description of focus groups or questionnaires, no statement about original number of participants, sample size, how participants came to be involved in study, no statistical analysis described, but some percentages provided	By development and implementation of info and communication technology confidence and competence in the family care setting can increase and nursing and social service support work can be further developed Can increase the quality of life for disabled and elderly and their family carers	

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Mahoney D, Tennstedt S, Friedman R, Heeren T. An automated telephone system for monitoring the functional status of community-residing elders. Gerontologist 1999; 39(2):229-234. **USA** Massachusetts	Small sample size Convenience sample High dropout rate No comparison group	If costly services are provided to older individuals who do not perceive them as needed and thus refuse to use them, then system inefficiency and financial waste occurs. At a practical level, a more realistic approach may be to identify what the client perceives as a need and wants help to address Automated telephone inquiry could be used to monitor less disabled older persons who are determined to be ineligible for the home care services or whose services have been reduced or terminated	
Markson LJ, Friedman RH, Jette AM, Kazis L. Computers as clinician extenders: monitoring chronic illness in elderly patients. International Journal of Technology and Aging 1992; 5(2):153-165. **USA**	No study conducted Pilot study described are a group of volunteers	System could be adapted to accommodate a wide range of disabilities and therefore would be helpful to elderly persons	

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McGrew KB, Quinn CA. Examining the effectiveness of telephone assessment and care planning for homecare services. Generations 1997; 21(1):66-67. **USA**	1/4 of the telephone assessments were completed by an informant who was not the client	Judicious use of telephone assessment and care planning in similar programs can be successful Development of mechanisms for communication and feedback is essential to effective utilization of telephone practice Using the telephone assessment as a baseline, a mechanism for feedback from service providers and care managers should be established to contribute relevant info to the ongoing assessment and to substitute ftf assessment and care planning where needed Time costs of phone contact with multiple sources need to be weighed against time costs of ftf in home assessments to evaluate the CE of phone practice	

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Author / Title / Journal / Year / Country / Location	Methodological Problems	Policy Recommendations	Applicability to Alberta
Montani C, Billaud N, Tyrrell J, Fluchaire I, Malterre C, Lauvernay N et al. Psychological impact of a remote psychometric consultation with hospitalized elderly people. J Telemed Telecare 1997; 3(3):140-145. **France** Grenoble	Small sample size Findings are not generalizable to wider population	Further work needed to investigate the impact of remote consultation with elderly patients in other types of health care settings	Some psychometric tests are used on a limited basis in Alberta over v/c technology including the MMSE. This study confirms reported clinican experience with respect to administration of the interlocking pentagons question in MMSE over video. It supports the need for validation of psychometric tests over v/c for not only geriatric clients but others as well. (prefernce for ftf)-- In Alberta v/c technology has been used for geriatric psychiatry consultation since 1997. The technology has been well accepted by clients.

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Montgomery AA, Fahey T, Peters TJ, MacIntosh C, Sharp DJ. Evaluation of computer based clinical decision support system and risk chart for management of hypertension in primary care: randomized controlled trial. BMJ 2000; 320(7236):686-690. UK Avon	Target reduction of 20 percentage points in the proportion of patients at high absolute risk was large Outcome measures were patient based but both interventions were aimed at health care professionals The computer based system that was used only estimated risk and did not include other aspects of hypertension	Computer based clinical decision support systems which combine risk estimation and management recommendations for hypertension require further development and evaluation Further studies are required on -newer computer based clinical decision support systems -how the understanding of absolute risk can influence health professionals' decision making -how interactive computers can assist patients in decision making, treatment preferences, and adherence to treatment schedules	

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Neafsey PJ, Strickler Z, Shellman J, Padula AT. Delivering health information about self-medication to older adults: use of touchscreen-equipped notebook computers. J Gerontol Nurs 2001; 27(11):19-27. **USA**		Delivery of health info to older adults via touchscreen-equipped notebook computers has the potential to revolutionize patient education provided by gerontological nurses Computer assisted education about meds offers older adults opportunity to proceed at a pace and level effective for learning	
Persson M, Mjorndal T, Carlberg B, Bohlin J, Lindholm LH. Evaluation of a computer-based decision support system for treatment of hypertension with drugs: retrospective, nonintervention testing of cost and guideline adherence. J Intern Med 2000; 247(1):87-93.		The DSS which fully implements current guidelines may improve the quality of anti-hypertensive treatment, concurrently leading to a considerable reduction in drug costs	

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Author / Title / Journal / Year / Country / Location	**Methodological Problems**	**Policy Recommendations**	**Applicability to Alberta**
Pringle Specht JK, Wakefield B, Flanagan J. Evaluating the cost of one telehealth application connecting an acute and long-term care setting. J Gerontol Nurs 2001; 27(1):34-39. **USA**		The chronic wound clinic is a cost effective method of delivering care to residents in a long term care facility as well as an effective mechanism for nurses to consult with one another	
Riegel B, Carlson B, Kopp Z, LePetri B, Glaser D, Unger A. Effect of a standardized nurse case-management telephone intervention on resource use in patients with chronic heart failure. Arch Intern Med 2002; 162(6):705-712. **USA** California	Randomization of physicians rather than patients which may have introduced some selection bias Sample size not adequate to detect differences in outpatient resource use	Telephonic case management can significantly decrease physician office visits, hospital days, emergency visits, and rehospitlaization rates Future studies would be enhanced by careful logging and reporting of actual hours spent per case manager with each patient rather than applying an estimated average per patient	Follow-up of CHF clients (particularly ones who do not refuse to take medications) often falls to home care. This article represents a cost effective modell for treatment of CHF clients in an era of limited home care resources in may jurisdictions in Alberta.

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APPENDIX F: CRITIQUE GERIATRICS

Author / Title / Journal / Year / Country / Location	Methodological Problems	Policy Recommendations	Applicability to Alberta
Roush RE, Teasdale TA. Reduced hospitalization rates of two sets of community-residing older adults after use of a personal response system. Journal of Applied Gerontology 1997; 16(3):355-366. **USA, Canada**	No control group Study cannot be generalized to wider populations given that only people who subscribed for 1 year were eligible Comparison of US and Canada not overly feasible given the different health care systems in each country	PRS programs can be effective in reducing hospital utilization If quality of care can be maintained in conjunction with marked reductions in hospital usage by older PRS users, then perhaps a reduction of some magnitude in Medicare expenditures would follow. Were this to be documented prospectively, the obvious policy question would be: "Should modest monthly PRS charges be included in health care reform packages that emphasize preventative measures?" p. 362 Given that elderly people often prefer to stay in their own homes as long as possible, health care providers and policy makers should support complementary measures such as home care, PRS use, and respite care that may produce that desired result	
Sanz F, Silveira C, Alonso A, Diaz C, Loza MI, Cordero L et al. Telematics applications to support the role of the community pharmacists as self-medication advisors. TESEMED Consortium. Stud Health Technol Inform 1999; 68:764-767.		Positive results indicate a high users' acceptance of the TESEMED applications for community pharmacists Pharmacists can benefit from internet training	Poor

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APPENDIX F: CRITIQUE GERIATRICS

Author / Title / Journal / Year / Country / Location	Methodological Problems	Policy Recommendations	Applicability to Alberta
Scalvini S, Zanelli E, Domenighini D, Massarelli G, Zampini P, Giordano A, Glisenti F. Telecardiology community: a new approach to take care of cardiac patients. Cardiologia 1999; 44(10):921-924. **Italy**	Does not specify how the sample of general practitioners was chosen. Present only distribution statistics.	Cardiovascular disease represents the major epidemiological issue in terms of morbidity and mortality in Western countries. On these grounds it seems useful to test a territorial project aiming at shortening decision time, greater appropriateness of hospital admission, and when possible, out of hospital care. A distinctive interesting finding of this project is the frequent request by general practitioners to have optional teleconsultation (besides the ECG). This aspect confirms reliance and compliance of the general practitioners towards the specialist and outlines the potentials of a project.	

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Author / Title / Journal / Year / Country / Location	Methodological Problems	Policy Recommendations	Applicability to Alberta
Shah NB, Der E, Ruggerio C, Heindereich PA, Massie BM. Prevention of Hospitalizations for heart failure with an interactive home monitoring program. Am Heart Journal 1998; 135:373-8. USA	The study was not randomized Results may be affected by a number of biases related to the selection of patients and timing of entrance into the program Sample size small and does not allow for definite generalizations or conclusions		

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APPENDIX F: CRITIQUE GERIATRICS

Author / Title / Journal / Year / Country / Location	Methodological Problems	Policy Recommendations	Applicability to Alberta
Shea S, Starren J, Weinstock RS, Knudson PE, Teresi J, Holmes D et al Columbia University's Informatics for Diabetes Education and Telemedicine (IDEATel) Project: rationale and design. J Am Med Inform Assoc 2002; 9(1):49-62. **USA**		The IDEATel project is designed to provide data that will inform policy formation in several ways -Demonstrate the feasibility of a large-scale, web-based system for electronic delivery of health care services -If the intervention improves processes and outcomes of care for persons with diabetes, and the CE of electronic HC service delivery is supported by project findings, policies regarding reimbursement are likely to evolve -Reimbursement issues need to be considered, policies developed i.e.what is a reimbursable service unit? -Legal environment where medical and nursing professions are credentialed, licensed etc. needs to be considered as is different for all states	

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APPENDIX F: CRITIQUE GERIATRICS

Author / Title / Journal / Year / Country / Location	**Methodological Problems**	**Policy Recommendations**	**Applicability to Alberta**
Starren J, Hripcsak G, Sengupta S, Abbruscato CR, Knudson PE, Weinstock RS et al. Columbia University's Informatics for Diabetes Education and Telemedicine (IDEATel) project: technical implementation. J Am Med Inform Assoc 2002; 9(1):25-36. **USA**			
Stiles N, Boosalis M, Thompson K, Stinnett D, Rayens MK. Nutrition telemedicine consultation for rural elders. Journal of Nutrition for the Elderly 1998; 18(1):47-55. **USA**	Small sample size No control group Few participants reported negative reactions, but the selection of participants could have biased these results as only participants who agreed to a telemed consultation were included in the pilot project	Study demonstrates that geriatric nutrition consultation can be performed through telemedicine, but more research is required Increased resources targeting the nutritional health of rural elders with chronic medical conditions and supports consideration for the use of telemed in underserved areas	

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Author / Title / Journal / Year / Country / Location	Methodological Problems	Policy Recommendations	Applicability to Alberta
Strawn BD, Hester S, Brown WS. Telecare: a social support intervention for family caregivers of dementia victims. Clinical Gerontologist 1998; 18(3):66-69. **USA**		Telecare is effective in stress reduction of caregivers who care for persons with AD Telecare is a cost and time efficient means of providing social support and an effective medium for disclosure of psychological distress that may buffer the effects of caregiving and enhance general well being and perhaps maintain the physical health of the caregiver	
Subirana Serrate R, Ferrer-Roca O, Gonzalez-Davila E. A cost-minimization analysis of oncology home care versus hospital care. Journal of Telemedicine and Telecare 2001; 7:226-232. **Spain**	Small sample size	Telephone service to patients at home should be covered by private insurance companies and 24 hour telephone support should be carefully considered for oncology patient care at home	Maz encourages alternate models of care. It is interesting to note that one support to a service of this kind in Alberta could be the Link Service which is rolling out provincially and is including new services/ innovations.

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Author / Title / Journal / Year / Country / Location	Methodological Problems	Policy Recommendations	Applicability to Alberta
Tang WK, Chiu H, Woo J, Hjelm M, Hui E. Telespychiatry in Psychogeriatric Service: A Pilot Study.International Journal of Geriatric Psychiatry, 2001; 16: 88-93. **China** Hong Kong	Sample size too small to draw any firm conclusions No control group Some patients had dementia and thus had questionable ability to answer questions	-Response time is greatly improved with the use of TM as opposed to the average waiting time in the local clinic -Nursing staff do find that teleconsultation provided more health care support and saved time, but it was not easy to use -Telepsychiatry must be comparable to on-site visits in terms of cost in order for it to survive -CE studies should be done in all areas (geographically) as generalization of costs from one region to another is not appropriate Advantages of telepsychiatry over on-site visits -saving on traveling time of personnel -providing a service to persons in rural populations -facilitation of emergency consultations -CE in certain settings	
Townsend CH, Maxwell W, Sears LT. Nurse practitioner patient centered telephone calls in a VA primary care geriatric clinic. Journal of the American Academy of Nurse Practitioners 1997::269-275. **USA**			

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Author / Title / Journal / Year / Country / Location	**Methodological Problems**	**Policy Recommendations**	**Applicability to Alberta**
Wagner MM, Hogan WR. The accuracy of medication data in an outpatient electronic medical record. J Am Med Inform Assoc 1996; 3(3):234-244. **USA** Pittsburg, PA	Medication records in an outpatient EMR may have significant levels of data error Clinicians may not have completed forms accurately due to lack of time or interest	Authors conclude that the most effective extension to the EMR studied would be to expand its scope to include all clinicians who can potentially change meds. Even with EMR extensions, ineradicable error due to patients and data entry will remain	

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Author / Title / Journal / Year / Country / Location	Methodological Problems	Policy Recommendations	Applicability to Alberta
Wasson J, Gaudette C, Whaley F, Sauvigne A, Baribeau P, Welch HG. Telephone care as a substitute for routine clinic follow-up. [see comments]. JAMA 1992; 267(13):1788-1793. **USA** Vermont	Despite the random assignment of patients differences in important variables between groups might still have influenced the findings Participating patients and clinicians knew which study protocol was used Generalizability of study questionable ie.only men used in study	If results were replicated and found to be positive, telephone care could have widespread appeal to patients For most patients with chronic disease, telephone care offers significant benefits: 1.increased frequency of clinician contact 2. Less waiting and travel time 3.lower cost 4. possibility for reduced mortality and improved function Telephone care will not be widely adopted unless changes are made in current reimbursement policies to encourage office visits and test ordering and to pay for telephone care	
Weinberger M, Nagle B, Hanlon JT, Samsa GP, Schmader K, Landsman PB et al. Assessing health-related quality of life in elderly outpatients: Telephone versus face-to-face administration. Journal of the American Geriatrics Society 1994; 42(12):1295-1299. **USA** North Carolina	Did not randomize the order in which the SF-36 was administered (telephone / ftf) Small selected sample Did not test inter-rater reliability	Additional research is needed to determine whether these findings are unique to this particular patient sample, elderly persons in general, or to broader groups of individuals Until additional research is conducted we conclude that the two modes of administration may not be interchangeable	

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Author / Title / Journal / Year / Country / Location	Methodological Problems	Policy Recommendations	Applicability to Alberta
Welch HG, Johnson DJ, Edson R. Telephone care as an adjunct to routine medical follow-up. A negative randomized trial. Eff Clinic pract 2000; 3(3): 123-130. **USA** Colorado, South Dakota	Possible problems in the failure to replicate the previous study are discussed	The question of how frequently physicians should see patients with chronic disease needs to be studied more directly	

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APPENDIX G: CRITIQUE FIRST NATIONS

Author / Title / Journal / Year / Country	**Purpose/ Objectives**	**Design**	**Analysis**	**Participants: age / gender / groups**	**Intervention/ Duration**	**Follow-up: sample size; dropout**
Beck RD, Saddler C, Ranch R. Preliminary experience with an orthopedic teleradiology service at the Alaska Native Medical Center. Int J Circumpolar Health 1998; 57 Suppl 1:689-690. **USA** Alaska	Describes the preliminary experience of the Alaska Native Medical Centre (ANMC), Anchorage, Alaska, providing teleradiology services to a regional hospital	Descriptive study (VIII) Strength of Evidence (SoE): Poor	Cost comparison (estimates used)	62 patient cases Note: The ANMC provides comprehensive orthopedic care to 103,000 First Nation peoples in the state of Alaska.	Pilot Project between ANMC and a regional hospital Transmission system consists of a PC and film digitizer; Display system is PC and monitor In first 6 months, 157 films were transmitted pertaining to 62 patient cases	Not reported

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Health Canada, First Nations and Inuit Health Branch (Dal Grande E). Community services in the 21st century: First nations and Inuit telehealth services. National First Nations Telehealth Research Project HTF-NA402. Health Canada 2001. **Canada**	Very large project stating the importance of telehealth for First Nations and Inuit populations. Project has many objectives including: Relating to health care: -To improve linkages between the community health facility and provincial primary/secondary/tertiary care centers and/or education facilities -To reduce travel time -To improve access of community members to health info/education and to specialist health care Related to Knowledge: -To conduct an evidence based assessment of the benefits to the community of telehealth -To learn the most effective and appropriate ways to introduce telehealth in FN communities and how to provide opportunities for FN to contribute to telehealth implementation	Descriptive (VIII) SoE: Poor	All data from the patient encounter forms and satisfaction q'aires were entered into databases and analyzed using SPSS Qualitative data from the key informant interviews was transcribed and analyzed using matrix analysis techniques For the economic analysis, the cost-consequence analysis matrix developed by McIntosh and Cairns was used (1999)		This $2M project involved the planning, implementation, operation, and evaluation in five FN communities across Canada Three year study	

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Johnson RJ. The potential for Ontario region's health information system to facilitate case management, program planning, and evaluation and to promote enhanced First Nations' control of health services. Int J Circumpolar Health 1998; 57 Suppl 1:671-674. **Canada** Ontario	Paper describes how Ontario Region's Health Information System (HIS) can facilitate case management and program planning and evaluation activities and promote enhanced First Nations' control of the delivery of health services	Descriptive study (XIII) SoE: Poor	None	None	None	None

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Lapham SC, Henley E, Kleyboecker K. Prenatal behavioral risk screening by computer among Native Americans. Fam Med 1993; 25(3):197-202. **USA** Albuquerque, New Mexico	Focus of the study was to determine whether a patient interactive computerized assessment and education program was an acceptable means of obtaining behavioural risk data re: screening pregnant patients for substance abuse	Cohort Study (VI) SoE: Fair Patients receiving care during June 21, 1989 to July 31, 1990	Data collected on each subject were analyzed using Statistical Analysis Systems (SAS) Chi-square analysis and the Fisher's exact test were used for determining inference for descreet variables and general linear models; SAS used for continuous variables McNemar's paired sample test of nominal scale data used to compare computer reports with info recorded on prenatal charts	674 Native American women received prenatal care in the two participating clinics 207 ineligible and could not contact 61 Of the remaining 409, 265 participated in the study Final n=265 All women Age, marital status, number of children, years of schooling, work status all variables reported	13 month enrollment period Study participants completed a computer interview, and computer-generated reports of substance use and physical abuse within the past year were compared with info in the participants' prenatal records Pregnancy Information Program (PIP) is a patient interactive computer program designed to assess behavioural risks and provide health education for pregnant women	All 265 participants who participated completed the study

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Lessing K, Blignault I. Mental health telemedicine programmes in Australia. J Telemed Telecare 2001; 7(6):317-323. **Australia** Brisbane	National survey of mental health telemedicine programs conducted and data collected on their - catchment areas, - organizational structure, - equipment, - clinical and non clinical activity and - use by populations who traditionally have been poorly served by mental health services in Australia	Descriptive - survey (VIII) SoE: Poor Mail questionnaires sent to 23 locations with mental health telemedicine programs	Coding of all quantitative variables Responses coded by hand of the q'aires and then entered into a database Data verified through a process of re-entry of all codes Frequency tables generated for each variable Analysis done using simple descriptive statistics	23 programs participated		

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Author / Title / Journal / Year / Country	**Purpose/ Objectives**	**Design**	**Analysis**	**Participants: age / gender / groups**	**Intervention/ Duration**	**Follow-up: sample size; dropout**
O'Neill SK, Denton GL, Brockway PD, Davidson M, Wallsten D. Demonstration of the usefulness of telehealth in providing enhanced primary health services to the northern, geographically remote communities of Trout Lake, Peerless Lake, and Red Earth Creek, Alberta. Keeweetinok Lakes Regional Health Authority No. 15, Slave Lake, Alberta, 2000. **Canada** Alberta	Study was proposed to demonstrate the usefulness of telehealth in facilitating enhanced primary health services to the northern, geographically remote communities of Trout Lake, Peeless Lake, and Red Earth Creek (aboriginal communities)	Descriptive (VIII) Demonstration project SoE: Poor Creation of a telehealth database using Microsoft Access 97	No clear analysis reported (no statistics other than percentages and simple bar graphs) System usage was tracked User satisfaction data collected Client and Provider Q'aires used	Not reported	Duration of project: Jan 1, 1999 to May 31, 2000 -telehealth database was designed to collect all telehealth activity in the entire region during this time	Not reported

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Otto CA. Telemedicine in the Canadian High Arctic and Other Remote Environments. Proceedings of the 21st IEEE Engineering in Medicine and Biology Society Conference 1999; 2:709. **Canada** Baffin Island	One page article describing remote telemedicine systems Discusses the Baffin Telehealth Project which serves the remote communities of the Canadian High Arctic	Descriptive study (VIII) SoE: Poor	None	None	None	None

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Author / Title / Journal / Year / Country	**Purpose/ Objectives**	**Design**	**Analysis**	**Participants: age / gender / groups**	**Intervention/ Duration**	**Follow-up: sample size; dropout**
Schinke SP, Moncher MS, Singer BR. Native American youths and cancer risk reduction. Effects of software intervention. J Adolesc Health 1994; 15(2):105-110. **USA**	Towards developing attractive and effective means to reduce cancer risks faced by Native American people, this study developed and tested interactive computer software to improve dietary choice and prevent tobacco use among Native American adolescents	RCT (II) SoE: Good A cancer prevention lesson was developed and programmed for software Pretesting and posttesting done of youths in intervention and control groups	Analysis unclear Test-retest reliability using Cohen's method of calculation	n=368 youths to test the software 54.4% female Aged 10-14 years (mean age 11.88 years, SD 1.27) from the Southern US Youths self identified as American Indian or Native American Intervention arm n=233 Control arm	Youths in intervention lesson completed software lesson which included pre and post testing at beginning and end of exercise Control group completed paper and pencil version of pre and post tests, and watched video in between to provide placebo effects of attention	Post interaction differences were analyzed and found that of four items that did not distinguish between intervention and control arms

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APPENDIX G: CRITIQUE FIRST NATIONS

Outcomes/ Socio-Economic Indicators	**Methodological Problems**	**Policy Recommendations**
Clinicians report increased satisfaction with the improved level of support Specialists report satisfaction derived from increased confidence in accuracy of diagnosis Potential savings in $18,000 due to 6 cases that would have resulted in unnecessary transportation to Anchorage in the absence of the teleradiology system	No control group No study conducted	Some clinician reluctant to use the system Transmission of multiple cases can be a lengthy process Overall, system is a significant improvement; improved and more cost effective patient management

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Outcomes/ Socio-Economic Indicators	Methodological Problems	Policy Recommendations
Various outcomes are reported for each community in the form of case studies Overall recommendations include: -New research be undertaken to further explore issues raised in the context of this project and to build a unique body of knowledge needed for the implementation of successful TH initiatives in FN and Inuit communities -Opportunities to undertake TH should be offered in a manner that is equitable and sustainable across all FN and Inuit communities -New research should study the system wide impact of TH on various funding envelopes on and human resource infrastructures of communities -Increased awareness/understanding of FN and Inuit stakeholder in matters relating to TH will enable them to take the advantage of new and exiting initiatives and funding opportunities		Linkages between telehealth and other initiatives of the Aboriginal Health Infostructure (such as FNIHIS, EHRs and health research initiatives), as well as with Canadian Health Infostructure initiatives, are critical in order to leverage investments to benefit Aboriginal peoples -Policy success factors: -flexibility/choice in referral patterns -harmonization of F/P/T initiatives -positive evaluations of telehealth -federal coordination of non-insured health benefits/telehealth policies

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Outcomes/ Socio-Economic Indicators	Methodological Problems	Policy Recommendations
With access to various client specific reports in HIS, it is anticipated that health care providers will be able to conduct case management more effectively Development of HIS has almost been completed, system needs to be implemented		HIS has the potential to provide First Nations with a significant degree of autonomy from federal government with regards to access to health info for case management, program planning and evaluation, disease surveillance, an the establishment of their own program priorities at the community level

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Outcomes/ Socio-Economic Indicators	**Methodological Problems**	**Policy Recommendations**
More than 95% of participants who completed the computer interview rated it favorably Drug use and physical abuse were reported significantly more often during the computer interview compared with the info obtained from the patients' medical records High rate of accuracy validated in self-reporting	Several limitations of the study noted ie. participants notified in advance urine testing would be done to confirm/refute statements they had made regarding drug use Cannot make generalizations to all Native American women as participants were primarily urban Some participants may not have been able to read the interview	Anonymous computer interviews obtained valid information about substance abuse and increased reporting of physical abuse Computerized assessment well received by patients, yields valid info regarding risk factors for adverse pregnancy outcomes This study may not be applicable to all Native Americans

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Outcomes/ Socio-Economic Indicators	**Methodological Problems**	**Policy Recommendations**
Small discussion of applicability to Aboriginals saying telehealth helpful Only 16 of the 23 programs could provide clinical information and found that the average for all 16 programmes was 123 sessions of direct clinical care per program per year		Findings suggest mental health telemedicine programs are making a contribution to the implementation of such policies as equal access to health care To reduce inequalities and improve access to services levels of use of telehealth will need to be increased.

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Outcomes/ Socio-Economic Indicators	Methodological Problems	Policy Recommendations
Utilization data reports that total regional usage was 417.17 hours over 17 months with an average usage rate of 24.5 hours/mo -236 telehealth session logged over 17 months -63% of staff rated telehealth system as very good or good -upward trend in telehealth activities in Northern Communities -decreased travel and cost for clients and family was demonstrated	This is a very large study with no clear statistical analysis	Study recommends that: -Alberta Health and Wellness in partnership with Northern Alberta Development Council should lobby Telus to improve telecommunications in northern and rural areas -Telehealth be considered a viable option to provide health services -Equipment be leased rather than bought -Health service staff must be knowledgeable about the use of advanced technology such as telehealth through specific courses or practicum's within their basic educational programs -Implementation of high technical medium such as telehealth for service delivery be given "due process" prior to implementation

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Outcomes/ Socio-Economic Indicators	**Methodological Problems**	**Policy Recommendations**
Using technologies from remote telemedicine systems this project has overcome isolating geography to provide enhanced healthcare to the communities of the Baffin Region		

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APPENDIX G: CRITIQUE FIRST NATIONS

Outcomes/ Socio-Economic Indicators	Methodological Problems	Policy Recommendations
Outcomes from the q'aires completed by youths before and after interacting with the lesson suggest the potential of microcomputer software as a vehicle for delivering cancer reduction intervention Intervention group gained knowledge about nutritional factors associated with cancer prevention and they acquired attitudes facilitative of implementing that knowledge Gain in score (pre- to post-test) was significantly greater for intervention group than for the control group	Study results not generalizable to wider population Behavioural measure of diet and tobacco, including the validation of self reported data, were not part of this study No long term follow-up measurements to determine the sustainability of change	Youths do learn from the software, but future research is needed to quantify long term learning and behaviour change Lessons, as in this case, should be presented within a culturally sensitive context

Note: Abbreviations used in this document are described in Appendix D

APPENDIX H: CRITIQUE TELE-HOMECARE

Author/ Article Title/ Year/ Country	**Purpose/ Objectives**	**Design**	**Analysis**	**Participants: age/ gender/ groups**	**Intervention/ Duration**	**Follow-up: sample size; dropout**
Alemi F, Stephens R, Parran T, Llorens S, Bhatt P, Ghadiri A, Eisenstein E. Automated monitoring of outcomes:application to treatment of drug abuse. Med Decis Making 1994; 14:180-187. **USA**	To evaluate the automated follow-up and monitoring system.	Non-experimental. Feasibility study to test the viability of telehealth to monitor a population that has been shown to be difficult to follow. SoE: Poor	Fisher test;to predict the accuracy of the relapse predictions, maximum Bayesian predictions were compared with clients' self reports during the five-month period.	42 recovering drug users and alcoholics	The computer interview and the written questionnaire consisted of 25 questions developed by relapse-prevention experts. The subjects were asked to call the computer and to answer the relapse-prevention questions on a weekly basis for five months. When subjects did not call in by their scheduled times, one week following their last interviews, the computer automatically initiated follow-up telephone calls containing the interview. Written questionnaires, consisting of the same 25 questions as in the computer interview, were sent to subject who completed four, ten, 14 and 18 computer interviews during the five-month period	n=42 A questionnaire was mailed to the participants asking about the satisfaction with the computer interviews. 50% of the 42 (n=21) returned the questionnaire.

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APPENDIX H: CRITIQUE TELE-HOMECARE

Author/ Article Title/ Year/ Country	Purpose/ Objectives	Design	Analysis	Participants: age/ gender/ groups	Intervention/ Duration	Follow-up: sample size; dropout
Allen A, Doolittle GC, Boysen CD, Komoroski K, Wolf M, Collins B, Patterson JD. An analysis of the suitability of home health visits for telemedicine. Journal of Telemedicine and Telecare 1999; 5:90-96. USA	To determine what percentage of traditional home health nursing visits could be done by telemedicine.	Non-experimental. Two kinds of data were collected. The first was objective data, that included demographic information, patient assessments, teaching activities and interventions. Subjective data involved the opinions of four observers as to whether the visit could have been done using currently available telemedicine technology. SoE: Poor	Summary statistics were used to describe the procedures, interventions and diagnosis associated with home health visits. To determine the extent to which home care visits could be done using telemedicine, chi squared was used to evaluate. One-way ANOVA was used to determine significant differences for all demographics.	Three home health care agencies participated, and clinical records from each were photocopied. Records were randomly selected from among home care visits logged between January 1, 1996 and 29 February 1996, and between June 1 and July 31 1996.	A retrospective chart review was done to asses what proportion of visits could be done using telemedicine. Developed their own clinical record abstraction instrument, the Home Health Activities Assessment Instrument in order to categorize nursing activities during the home health visit.	Number of clinical records analyzed n=906 4 of the 910 sampled records were rejected for analysis because of legibility problems. The final study sample therefore consisted of the records of the individual home nursing visits to 906 different subjects.

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APPENDIX H: CRITIQUE TELE-HOMECARE

Author/ Article Title/ Year/ Country	**Purpose/ Objectives**	**Design**	**Analysis**	**Participants: age/ gender/ groups**	**Intervention/ Duration**	**Follow-up: sample size; dropout**
Artinian NT, Washington OGM, Templin TN. Effects of home telemonitoring and community based monitoring on blood pressure control in urban African Americans: A pilot study. Heat and Lung 2001; 30(3):191-199. USA	Tested the following hypothesis: Persons who participate in nurse-managed home telemonitoring plus usual care or who participate in nurse-managed community based monitoring plus usual care will have greater improvement in blood pressure from baseline to 3 months follow-up than will persons who receive usual care only.	Randomized controlled design; participants were randomly assigned to 1 of 3 groups that were stratified by use of antihypertension medication. Stratification by use or non-use of antihypertension medication was used to ensure that at baseline the use or nonuse of the medication was fairly equal across all groups. SoE: Good to fair	One way ANOVA and ANCOVA were used. Fisher's test was also used.	Participants were recruited from a family community in a large city. Both men and women were included in the sample. 41.4% of the households were below the poverty line. Criteria for inclusion was age above 18 and an SBP greater than or equal to 140 mmHg or a DBP greater than or equal to 90mm HG, unless the person self-identified has having diabetes or claimed a history of heart attacks. Exclusion criteria was receiving hemodialysis, having been diagnosed with dementia or another mental illness defined as not being oriented to time, person, or place, having compliance risk, being homeless, or having another major health problem such as the terminal stages of cancer or advanced liver disease.	Those in the home telemonitoring group received telephone counseling about lifestyle modification. They were also instructed to measure their BP at home at least 3 times a week. The community based group was similar to the telemonitoring, with the exception that the measuring of the BP took place at the community centre. They visited the centre 3 times a week in the morning, and did receive a folder on lifestyle modification. The control group had regularly scheduled care by their primary provider. Contact was usually limited to less than 15 minutes.	N=26, 3 were men and 23 were women. N=6 in the home telemonitoring group, n=6 in the community based monitoring group, and n=9 in the control group. Only 21 participants had complete data sets after three months. All dropouts were from community based care or usual care.

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Author/ Article Title/ Year/ Country	**Purpose/ Objectives**	**Design**	**Analysis**	**Participants: age/ gender/ groups**	**Intervention/ Duration**	**Follow-up: sample size; dropout**
Barbaro V, Bartolini P, Bernarducci R. a portable unit for remote monitoring of pacemaker patients. Journal of Telemedicine and Telecare 1997; 3:96-102. **ITALY**	Describes a prototype system that transmits the patient's electrocardiograms and the main characteristics of the pacemaker to a monitoring centre.	Non-experimental. Description of a portable acquisition unit. SoE: Poor	none specified.	none mentioned	Description of a user-friendly system that allows a patient to record an ECG, measure the characteristic electrical parameters of the implanted pacemaker and send the information by telephone to a clinical centre. The data can be used by the centre to monitor its patients. The system reduces the number of checkups and may prove extremely useful in emergencies when patients feel they are experiencing a hazardous cardiac event. The infrared link and desktop controller are also described in the article.	none mentioned

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APPENDIX H: CRITIQUE TELE-HOMECARE

Author/ Article Title/ Year/ Country	**Purpose/ Objectives**	**Design**	**Analysis**	**Participants: age/ gender/ groups**	**Intervention/ Duration**	**Follow-up: sample size; dropout**
Biermann E, Dietrich W, Standl E. Telecare of diabetic patients with intensified insulin therapy. Medical infobahn for Europe, A. Hasman et al (eds) 2000:327-332 **GERMANY**	To evaluate if the restoration of metabolic control in patients with diabetes, on intensified insulin therapy, can be performed by non-personal contacts via telemedicine and how to judge patient satisfaction. Also focuses on the fiscal and administrative aspects of this technology.	Randomized control trial. A telemedical system for transmission of blood glucose values goes from the patient's home to the diabetes centre. Data is processed by PC and advice is given by the telephone. SoE: Good to fair	Means, standard deviations, and significance for HbA1 levels for both groups.	Patients with diabetes.	The telecare patients received a combined programmable interface and modem to transmit values. The centre was open 24 hours a day for transmission. Frequency and duration of every consultation either by phone or personally were documented. Personal visits in control group about one per month. Telecommunication about every 2.9 weeks.	N=46 (30 in the intervention group, 16 in the control group)

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Black S, Andersen K, Loane MA, Wootton R. The potential of telemedicine for home nursing in queensland. Journal of Telemedicine and Telecare 2001; 7:199-205. **AUSTRALIA**	The aim of the study was to investigate the potential of telemedicine for the delivery of home nursing in an Australian context.	Individual client case notes were randomly selected from 10 nursing centres. Community registered nurses undertook a retrospective review of client case-notes. Reviewers provided narrative comments where it aided in the overall understanding of individual characteristics. SoE: Poor	Descriptive statistics were computed for all variables and the analysis were performed using a spreadsheet.	Active case-notes were used. This meant all notes were for those clients still receiving care.	Independent review of client case-notes. After reviewing each record, the reviewer made a judgement as to whether any of the home nursing visits in the episode of care could have been conducted by telemedicine. The individual circumstances in each case were considered thoroughly, such as presence or absence of a competent carer who had been educated to provide the care was an important consideration, as well as client learning capacity, degree of independence.	A total of 12, 630 home visits were reviewed. n=166 set of case notes n=98 being women n=68 being men. Average age was 72 years old.

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Author/ Article Title/ Year/ Country	Purpose/ Objectives	Design	Analysis	Participants: age/ gender/ groups	Intervention/ Duration	Follow-up: sample size; dropout
Bondmass M, Bolger N, Castro G, Avitall B. the effect of home monitoring and telemangement on blood pressure control among african americans. **USA**	To determine 1. compliance with home blood pressure monitoring among hypertensive African Americans 2. the effectiveness of telemangement in blood pressure control within 1-3 months.	Non-experimental. A one-group, pre-post design. SoE: Poor	Data for all variables were tested for normal distribution. A repeated-measures ANOVA with Tukey's post hoc test was used for within subject comparisons. Chi square was used for discrete variables Pearson product moment for bivariate correlations. Wilcoxon rank-sum test was used for non-normally distributed categorical and continuous variables. Descriptive statistics and frequencies were used for demographics.	Subject were eligible for study inclusion if they were African American, greater than 18 years of age, and had a documented history of uncontrolled HTN for at least 1 year despite pharmaceutical treatment. Subjects were excluded if they had a history of myocardial infarction, stroke, or congestive heart failure within 6 months preceding study enrollment or if they did not have daily access to an operating telephone line.	A trained biotechnician installed the HM (home monitor) in each patient's home. This technician also taught each patient/family how to use the HM, and collected demographic and other psychosocial data. Patients were instructed to use the HM to measure their BP one to two times daily. Overweight patients were instructed to weigh themselves weekly. Data was received at the alarm-protected central monitoring station located at the medical centre. Patients were managed on the basis of the data and/or alarms.	50 self and physician referred patients were screened for eligibility. 11 patients were excluded from data analysis because they demonstrated sufficient blood pressure control during the first week of monitoring. 2 other patients were excluded because they did not have telephones. 4 of the 37 remaining patients were excluded because of non-compliance. Final cohort analyzed n=33

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Author/ Article Title/ Year/ Country	Purpose/ Objectives	Design	Analysis	Participants: age/ gender/ groups	Intervention/ Duration	Follow-up: sample size; dropout
Bondmass M, Bolger N, Castro G, Avitall B. the effect of physiologic home monitoring and telemanagement on chronic heart failure outcomes. The Internet Journal of Asthma, Allergy and Immunology 1999; 3(2):1-16. **USA**	To determine the effect of physiologic home monitoring and telemangement on chronic heart failure outcomes. Outcomes included hospital readmission's, length of stay, charges and quality of life.	Non-experimental. This study was the initial clinical testing of this form of telemedicine implementing interventions for chronic HF patients in the absence of face-to face contact. SoE: Poor	Data for all variables was tested for normal distribution. Paired T-tests for within-group pre-post comparisons were used for normally distributed, continuous variables, and chi squared for any discrete variables. Wilcoxon test for non-normally distributed categorical and continuous variables. Descriptive statistics and frequencies were used for demographics. ANCOVA was used to test for confounding variables that might have affect the statistical significance of the results.	Inclusion criteria was at least one of 1.documented diagnosis of HF as determined by radiographic evidence of pulmonary congestion 2. documented New York Heart Association functional classification III or IV 3. conventional clinical HF symptoms of dysnea and edema that responded to diuresis 4.ECG evidence of heart failure (either systolic or diastolic dysfunction). Exclusion criteria: unstable angina, renal failure, severe dementia or other debilitating psychiatric disorder, end-stage heart failure requiring regular inotropic infusions, anticipated survival of less than 6 months, planned discharge to a long-term care facility, current illicit drug use, participation in another HF research protocol within the last six months, lack of operating home telephone line.	After discharge from a heart failure hospitalization, patients used the HM for two to three months, and transmitted data 1-2 times daily. Patients were asked to transmit more frequently to assess responses when medications were being actively titrated. The primary outcomes were analyzed at three, six and twelve months following study enrollment. These data were compared to each participant's previous history of HF admissions, length of stay, and hospitalization charges from three, six and twelve months prior to enrollment.	130 hospitalized patients were identified during the time frame. 70 patients were excluded from research. 60 patients met the inclusion/exclusion criteria. N=60 mean age was 61. 67% of sample were women.

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Author/ Article Title/ Year/ Country	Purpose/ Objectives	Design	Analysis	Participants: age/ gender/ groups	Intervention/ Duration	Follow-up: sample size; dropout
Bruderman I, Abboud S. Telespirometry: novel system for home monitoring of asthmatic patients. Telemedicine Journal 1997; 3(2):127-133. **ISRAEL**	To describe a newly developed telespriomtry system consisting of a portable spirometer that transmits the lung ventilatory values by telephone from the patient's home to a remote monitoring center and to assess the ability of the telespirometry system to detect early signs of asthmatic deterioration.	Non-experimental. Patients with differing levels of asthma were tested. SoE: Poor	Deterioration was defined as a 25% or greater decrease from the patient's best in two or more spirometric indices prior to MICU dispatch. The spirometric data was analyzed retrospectively to detect early signs of asthmatic deterioration, which resulted in MICU dispatch.	39 patients were included in the study, 23 with moderate asthma and 16 with severe asthma. 18 were male, 21 were female.	The lung function testing and transmission of the spirometric data by telephone from the patient's home to a remote monitoring center were performed according to the patient's judgement. An operator at the center receives the telephone call from the patient, who is identified by name or a number. The patient transmits the data to the receiving center by placing the telephone handset on the spirophone speaker. The telespirometry system was installed in a medical emergency service. The decision to transmit the spirometric data from the patient's home to the center was based on the patient's judgement. In case of acute respiratory distress, patients received standard emergency treatment at their home from a mobile intensive care unit.	n=39

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Celler BG, Earnshaw W, Ilsar ED, Betbeder-Matibet L, Harris MF, Clark R, Hesketh T, Lovell NH. Remote monitoring of health status of the elderly at home. A multidisciplinary project on aging at the University of New South Wales. International Journal of Bio Medical Computing 1995; 40:147-155. **AUSTRALIA**	Discusses the design and implementation of a multidisciplinary research project and associated field trials to test the hypothesis that functional health status amongst the elderly can be accurately determined remotely by continuously monitoring relatively simple parameters that measure the interaction between participants and their environment.	Descriptive. Paper discusses several phases of an on-going project. During the preparation phase, focus groups with elderly outpatients was used to generate qualitative data. During the field trial stage (not completed yet), there will be two groups of participants. SoE: Poor	none mentioned	In the field trial phase, there will be 75 elderly participants. They will be randomly selected from a register of patients. People 65 and older who live alone will be eligible.	After induction the field trial participants will be visited on a regular weekly basis for a period of three months. The data from each home visit will be recorded on site using a palmtop computer. Data will be downloaded to the project database on a daily basis. Patients will also be asked to keep a daily diary which will record any significant symptoms and health events as well as changes in behavior. This diary will enable closer correlation with remotely monitored data and will reduce recall bias by providing daily information to match with the weekly visits.	none

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Celler BG, Lovell NH, Chan DKY. The potential impact of home telecare on clinical practice. MJA 1999; 171:518-521. **AUSTRALIA**	Descriptive article: focusing on impact of home telecare.	Descriptive. SoE: Poor	Discusses two cases, one on detecting delirium and one on home heart monitoring.	No participants, but does used two cases to illustrate points.	As home telecare may become increasingly relevant as the population ages, it is useful to consider management and clinical service delivery requirements in the context of the need for services. Chose to describe three broad and overlapping age-related categories: preventative healthcare and education for self-management, health maintenance, and health support. Preventative healthcare is the first phase, with a rapid increase in healthcare costs (between the ages of 55 and 65 years). Second phase, pre-existing medical problems will require more assiduous management (health maintenance). Health support is the third phase.	none discussed.

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Chan M, Bocquet H, Campo E, Val T, Esteve D, Pous J. Multisensor system and artificial intelligence in housing for the elderly. Gerontechnology, A Sustainable Investment in the Future 1998; J. Graafmans et al (eds). IOS Press. **FRANCE**	Addresses the issues of gerontology, and then the multi-sensor system used is outlined. Finally, main functionalities are detailed.	Descriptive study. SoE: Poor	None mentioned.	Elderly people are the focus of how the technology can be used.	Describes how a multi-sensor system is installed in the elderly patient's apartment to detect presence such as walking, motion. Habits can be learned. System can generate real time warnings when there is deviation to the schedule, storage of past data, and longitudinal information.	Descriptive explanation of research that had/or will be conducted.

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Author/ Article Title/ Year/ Country	Purpose/ Objectives	Design	Analysis	Participants: age/ gender/ groups	Intervention/ Duration	Follow-up: sample size; dropout
Chung M, Akahoshi M. reducing home nursing visit costs using a remote access infusion pump system. Journal of IV Nursing 1999; 22(6):309-316. USA	Summary of the experience using a new Intravenous Pump technology. Objectively looked at the impact on reducing after-hours and unscheduled home nursing visits and estimated the cost savings from real system costs of the organization.	Non-experimental. Monitoring of IV therapy. SoE: Poor	Frequencies. Cost information was based on the average home nursing visit. This was calculated using all costs associated with the nursing visit divided by an average number of visit per nurse factor. Costs included wages, benefits, vacation and sick leave, telephones and beepers, automobile expenses, travel time, and administrative overhead.	Average patient age was 45 years (31-67). Primary sources for patient recruitment were an oncology clinic and pain management treatment centre.	Choice of pump was the Verifuse ambulatory system. A 4-month period was selected to assess a typical number of patients and therapy mix and to quantify the number of nursing visits that were avoided with the use of remote access and remote programming. The use of the telephone key pad improves patient care efficiency by providing every clinician the ability to communicate, via telephone with a touch-tone key pad, with patients receiving IV therapy via the IV device.. Remote communication is used to receive the status of the current IV protocol or to program the pump with a new IV protocol.	n=7 10 treatment courses were evaluated on these patients. They were either already using the IV system with the remote access system, or were new patients starting therapy during the evaluation period.

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Author/ Article Title/ Year/ Country	Purpose/ Objectives	Design	Analysis	Participants: age/ gender/ groups	Intervention/ Duration	Follow-up: sample size; dropout
Cost reengineering report 1999:122-125. USA	Descriptive article detailing a telemedical neurosurgical network.	Non-experimental. Informal cost-benefit analysis. SoE: Poor	None mentioned.	Article deals with the experience neurosurgeon and how he implemented telemedicine at some hospitals.	It was believed that neuro images could be moved across the phone lines, as radiologists have done in the past. The system was designed so that the neurosurgeons were able to receive the transmitted images anytime.	not applicable.

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Author/ Article Title/ Year/ Country	Purpose/ Objectives	Design	Analysis	Participants: age/ gender/ groups	Intervention/ Duration	Follow-up: sample size; dropout
Dansky KH, Bowles KH, Palmer L. How telehomecare affects patients. Caring, 1999:10-14. USA	To test the effects of telemedicine on quality of care and financial costs associated with home health services.	Descriptive. Questionnaires and focus groups. SoE: Poor	Focus groups are used to evaluate nurses responses and to give them opportunities to discuss patient's responses. Notes from focus groups are coded and analyzed.	diabetic patients who are discharged from the hospital and referred. Control group and intervention group. Intervention group received video visits in addition to skilled nursing visits, while patients in the control group received skilled nursing visits only. A standardized diabetes clinical pathway is used for patients in both groups. 9 staff nurses were selected specifically for the project, based on clinical expertise with diabetic patients.	Patient must be assessed to determine whether this technology is appropriate and acceptable. Must determine if the patient can participate. Home environment must be assessed (electricity, lighting, space, protection from theft). Medical sensors on the machine include sphygmomanometer and stethoscope. A keyboard and mouse allow the nurse to manipulate the image acquired by the patient camera and capture still images for medical use.	not discussed

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Dansky KH, Palmer L, Shea D, Bowles K. Cost analysis of telehomecare. Telemedicine Journal and e-Health 2001; 7(3):225-232. **USA**	Purpose of the study was two fold. 1) to test the3 effects of telehomecare on clinical outcomes. 2) to estimate the financial costs associated with providing telehomecare services.	RCT Comparison of groups that did or did not have video visits in addition to skilled nursing visits. Data was collected on admission and at 60 days or discharge from home care, whichever came first. SoE: Good	Examined costs, both direct and indirect. Focus was on those costs occurring at the home health agency level. Costs for home visits were estimated using the Bureau of Labor's most recent figures on average hourly wage for registered nurses in the area. Multivariate analysis of clinical outcomes and cost effectiveness are not available but are underway.	171 diabetic patients, randomly assigned to either the intervention group (n=86) or the control group (n=85)	Patients in the intervention group received video visits in addition to the skilled nursing visits. Those in the control group received skilled nursing visits only. A patient station was placed in the intervention group patient's home for 60 days or until discharged from home care. The patient and the clinician station were linked together over ordinary phone lines via a standard modem.	N=171

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de Lusignan S, Wells S, Johnson P, Meredith K, Leatham E. Compliance and effectiveness of 1 year's home telemonitoring. The report of a pilot study of patients with chronic heart failure. European Journal of Heart Failure 2001; 3:723-730 **UK**	Attempting to discover whether telemonitoring would be a feasible way to collect objective data, free from the white coat hypertension effect, and whether the data collected would lead to management of this chronic condition. Also wanted to know if patients would comply with a full year of telemonitoring and tele-consulting, or whether the technique was only suitable for shorter intervention periods.	Randomized control study, where participants were put into intervention or control group. Study nurses reviewed the data collected to see whether there were changes suggestive of deterioration in health. The intervention group had blood and pressure devices, and this allowed them to monitor their vital signs. SoE: Good to Fair	At the end of the study, all the data collected was plotted graphically, with key events overlaid. Two researchers then proceeded to examine the data to look for patterns or trends that preceded these events.	Participants were all patients who were diagnosed with heart failure. Average age of the participants was 75.2 years The exclusion criteria were terminal diagnosis of patient or cohabitee, and dementia or confusion such that the patient could not comply.	The intervention group monitored their vital signs, which was then transferred by radio to a box under their telephone, and from their to the server at the hospital. The collected data could then be reviewed by a cardiologist or clinical physiologist. The telemedicine group also had the ability to video consult. The control group received standard general practice treatment.	24 approached, 20 consented. N=20 (10 in control group and 10 in intervention group). Two patients subsequently dropped out(8 in intervention group). There were 5 deaths during the year of the study. Three in the control group (n=7) and two in the intervention group (n=6).

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Demiris G, Speedie S, Finkelstein S. A questionnaire for the assessment of patient's impressions of the risks and benefits of home telecare. Journal of Telemedicine and Telecare 2000; 6:278-284. **USA**	To assess patient's impressions of the risks and benefits of home telecare.	Non-experimental. Pre-test questionnaire; questionnaire. SoE: Poor	Correlations and Cronbach's alpha.	For the pre-test 32 subjects were recruited. For the final reduced version, 10 subjects were recruited. Both sets of participants were recruited from a church community	The following domains were defined as elements of home telecare that needed to be addressed by the questionnaire; effect on quality of and access to health care, time and money, factors related to the conduct of a virtual visit, and general impression of the concept of home telecare.	Pre-test n=32 (n=20 women n=12 men). Final version n=10 (n=7 women n=3 men).

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Demiris G, Speedie SM, Finkelstein S. Change of patient's perceptions of telehomecare. Telemedicine Journal and e-Health 2001; 7(3):241-247. USA	To measure patient's perceptions of a telehomecare system before and [illegible] e [illegible] in it [illegible] atify the features of the system that patients perceived differently after experiencing it.	Randomized controlled trial. A pre-test was given , and from that the patients were randomly assigned to a control group receiving standard care or to an experimental group receiving video conferencing and Internet access in addition to standard care. SoE: Fair	Paired t-tests were performed to compare total scores and responses to each of the items within the groups and an unpaired t-test was used to compare change of perceptions between groups.	Patients were randomly assigned to one of the three rural or urban sites that participated in the project. The inclusion criteria on the study was to have a primary diagnosis of CHF, COPD, or requiring WC. They must be able to read and write english, have a television in their home and have a housing condition that enables the installation of the equipment (eg. phone close to the television set, enough space, etc).	Potential candidates were approached by a nurse who explained the study. Patients who agreed to participate filled out the questionnaire that measured perceptions of telehomecare. The two experimental groups were combined. Patients filled out the questionnaire the second time after 4 weeks or at exit from home care.	total n=28 control group n=11 experimental group n=17.

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Doolittle GC, Yaezel A, Otto F, Clemens C. Hospice care using home-based telemedicine systems. Journal of Telemedicine and Telecare 1998; 4(1):58-59 USA	Study to collect baseline data and to test the feasibility of hospice care using a telemedicine system based on the public telephone network.	Non-experimental. Pilot study; feasibility study. SoE: Poor	none mentioned.	6 hospice patients. Interactive video-units were also installed in the homes of three nurses who received after-hours calls.	Interactive video equipment was installed in the homes of the patients (identical equipment in the homes of three nurses). The total number of visits (by home or in person) conducted by the nurse, social worker, chaplain and aide were recorded. Initial instruction and training of patients and family members was performed at this time. For those patients who experienced difficulty walking or for those who were bedridden, the telemedicine unit was place in the bedroom and a system devised so that the patient or caregiver could turn on both the television and the camera unit with a single switch located close to the bed.	none mentioned

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Doolittle GC. A cost management study for a home-based telehospice service. Journal of Telemedicine and Telecare 2000; 6(1):193-195. **USA**	To measure costs for traditional hospice care as well as those associated with launching and operating a telehospice service.	Descriptive. SoE: Poor	Cost analysis	Data was collected for traditional hospice services from January to March 1997, and from January to March 1998. Data was collected from the telehospice service from January to March 1998. There were 6 full-time providers-four nurses and two social workers-involved with providing traditional and telehospice care.	Cost data for personnel costs and operational expenses on the project were obtained from the director of the hospice. The cost per patient was extrapolated from several sources. The individual hospice providers made estimates of time spent on the project. Time sheets were analyzed for the time spent on in-person evaluations, including travel time and the time spent with the patient. For telehospice visits, the time spent on the telemedicine system was recorded by the hospice nurse.	none mentioned

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Finkelstein SM, Speedie SM, Lundgren JM, Ideker M. Telehomecare: connecting the home and the home care agency. Caring Magazine 2000; July:32-35. **USA**	Describes the telehomecare project and it's findings to date. Mentions a pilot study to determine feasibility of recruiting subjects, training patients and nurses, installing equipment and running virtual visits.	Descriptive article, dealing with pilot study of the 'Telehomecare' project. The project has three study groups, where patients are randomly assigned to one of three groups, stratified by medical problem. Project has been implemented in three phases. SoE: Poor	none	This project focuses on patients with congestive heart failure, chronic wound healing or chronic obstructive pulmonary disease.	The project has three groups, the control group for all three medical problems receives standard home health care, and there are two study groups for the CHF and COPD patients. In the pilot study, patients used video conferencing, internet access and physiological home monitoring.	Gives n=24 for the pilot study.

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Gray JE, Safran C, Davis RB, Pompilio-Weitzner G, Stewart JE, Zaccagnini L, Pursley D. Baby carelink: using the internet and telemedicine to improve care for high risk infants. Pediatrics 2000; 106(6):1318-1324 **USA**	To evaluate an internet-based telemedicine program (Baby Care Link designed to reduce the costs of care, to provide enhanced medical, informational, and emotional support to families of very low birth weight infants during and after their neonatal intensive care unit stay.	A randomized control trial of the telemedicine program in a cohort of VLBW infants. Eligible infants were randomized within 10 days of birth. A satisfaction survey was used to asses family perceptions of the quality of care provided to them and their infant by the NICU. Quality of care, Hospital cost, Family visitation and integration with infant & staff measured. SoE: Good to fair	Statistical analysis was performed using SAS. Simple comparisons were done using chi squared testing or Wilcoxon rank sum tests.	Very Low Birth Weight infants were admitted to the Neonatal intensive care unit. N=75 Infants were excluded if ISDN access was not available at their family's primary residence of if the infants expected length of stay in the study NICU was expected to be less than 14 days.	Each family in the intervention group was given a single training session that focused on the hardware and software to be used in the homes. Families in the control group received information and support as usually provided in the NICU	176 VLBW infants were admitted to the NICU during the study period. 88 infants were excluded from the study. The families of 9 infants declined to participate, and another 4 were unavailable during the enrollment period. N=56 (26 randomized to intervention group and 30 randomized to receive normal care). The 7 siblings of infants in the intervention group and 12 siblings of control infants were placed in the same group as their randomized siblings.

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Gritzalis D, Lambrinoudakis C. A data protection scheme for a remote vital signs monitoring healthcare service. Medical Informatics 2000; 25(3):207-224. **GREECE**	Presents the results of a risk analysis, based on the CRAMM methodology, for a healthcare organization offering a patient home-monitoring service through the transmission of vital signs, focusing on the identified security needs and the proposed countermeasures.	Descriptive. SoE: Poor	The architectural and functional models of this service were utilized for identifying and valuating the system assets, the associated threats and vulnerabilities, as well as for assessing the impact on the patients and on the service provider.	none	no intervention	none specified

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APPENDIX H: CRITIQUE TELE-HOMECARE

Author/ Article Title/ Year/ Country	**Purpose/ Objectives**	**Design**	**Analysis**	**Participants: age/ gender/ groups**	**Intervention/ Duration**	**Follow-up: sample size; dropout**
Hanson EJ, Clarke A. The role of telematics in assisting family carers and frail older people at home. Health and Social Care in the Community 2000; 8(2):129-137 **UK**	Article describes the preliminary findings of the initial implementation phase of the ACTION research project that looks at assisting carers using Telematic interventions to meet older persons needs.	ACTION system was placed in a family's home for an initial period of 3 months. Case study approach was taken to the three families that participated. Conducted quality of life interviews and program/video evaluation questionnaires. SoE: Poor	A broad thematic analysis was carried out according to key areas of the interview guide. Attempted to view each interview as a whole, and to quote participant's own words.	Three family carers and older people agreed to participate. All three were identified as sole carers who received little or no formal support services.	The ACTION system was placed in the homes for three months. This enabled carers to access a range of empirically based multi-media programs in the home, such as education and information regarding coping, caring in daily life, financial information, planning ahead.	One carer had the ACTION equipment removed from her house after 1 month.

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Hayes RP, Duffey EB, Dunbar J, Wages JW, Holbrook SE. Staff perceptions of emergency and home-care telemedicine Journal of Telemedicine and Telecare 1998; 4:101-107. **USA**	Reporting of an evaluation of a low-bandwith telemedicine system in the ED (emergency department) and the affiliated home-health agency of a small urban hospital. Want to answer two questions: what are the benefits of such a system for the care of emergency or home-health patients and what are the barriers to the use of such a system in emergency medicine and home-health settings.	Pilot study. Qualitative interviews SoE: Poor	Content analysis	5 ED nurses and 6 HHA nurses were interviewed at the baseline site visit.	A base unit of one telemedicine system was placed in the ED of the pilot hospital. The portable system was available for use by the EMT's. They could use the unit to transmit images from an accident scene to the ED for review by ED physicians and nurses. Another base unit was placed at the home-health agency affiliated with the hospital. Home health nurses could transmit images of a patient to the central office for review by the medical director of the HHA. The still images could be printed out and delivered to the patients physicians to review at their convenience.	On the final site visit, an EMT and home-health nurse who had been interviewed at baseline were interviewed again, as well as the pilot project coordinator and an additional HHA nurse who had used the system since the follow-up interviews.

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Health Canada. Tele-homecare consultation workshop. August 7, 1998:1-19. **Canada**	This report is part of a series of reports issued regarding the aspects of telehealth in Canada.	Descriptive. A summary report based on a one day workshop on telehomecare. The workshop concluded with recommendations for immediate federal government consideration. SoE: Poor	none mentioned	50 representatives from industry, government, health services, organizations and academia offered their views on: the current status of tele-homecare projects, activities and initiatives; obstacles, barriers and opportunities for development; trends and future directions; potential federal initiatives.	no intervention. Was a one-day consultation workshop.	none

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Heidenreich PA, Ruggerio CM, Massie BM. Effect of a home monitoring system on hospitalization and resource use for patients with heart failure. Am Heart Journal 1999; 138:633-640. **USA**	Examined the effects of a low-intensity monitoring program on hospitalizations and cost of care for patients with heart failure treated by community physicians.	Enrolled patients in a multidisciplinary program. Intervention group, and a matched control group. SoE: Fair	Chi squared tests were used for differences in proportions. T-tests were used for comparisons between the control and program groups. Adjustment for the effect of patient age was performed using multiple regression.	Patients were eligible for the study if they were cared for by a physician within the medical group and their physician both agreed to participation and stated that the patient had a history of symptomatic heart failure. Potential patients with heart failure were identified through a claims database from April 1994 through October 1995. Control patients were derived from the same medical group who had a heart failure-related claim between April 1994 and May 1995, and who generated at least 1 claim after March 1996. They were matched 2:1 to intervention patients.	Each patient received a digital scale and an automatic blood pressure cuff and was instructed in their use. Each day the patient called a toll-free number and entered the systolic and diastolic blood pressure, pulse, weight, and any symptoms into a computerized voice answering system. If values were outside the accepted range of, or if new symptoms of shortness of breath, chest pain, or edema were reported, then the computer paged a nurse who confirmed the reported data by calling the patient. Once confirmed, the abnormality was described in a 1 page fax to the physician. Program was designed to be an aid to, not a replacement for, physician services.	128 patients identified, 26 were enrolled. The remaining 102 patients were not enrolled because the patient's physician stated that the patient did not have symptomatic heart failure, or would not agree to have the patient participate (n=87), the patient had left the medical group (n=10), or the patient refused (n=5). An additional 42 patients were enrolled at the request of individual medical group physicians whose patients were not identified by the 19-month window. n=68

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Horio H, Murakami M, Chiba Y, Inada H. Fetal monitor for non-stress-test screening at home. Biomedical Instrumentation & Technology 1998; 32:39-47. **JAPAN**	Evaluation of a fetal monitor for home NST (non-stress-test).	Non-experimental. SoE: Poor	not mentioned Questionnaire asking user satisfaction.	n=40 pregnant women with normal pregnancies. There were no inclusion or exclusion criteria.	Each woman received an approximately 30 minute explanation of how to use the fetal monitor and was then given it with her own IC card. The explanation described the procedure for detecting the fetal heart beat with Doppler Ultrasound, the way to fix the Doppler and UC sensors, and the procedure for NST self-monitoring, including telephone transmission. The patient did at least one NST measurement herself and sent the data to the hospital on a predetermined day each week. After delivery of the infant, each patient filled out a questionnaire to describe the experience and feelings she had about using the home monitoring device.	n=40

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Hui E, Woo J, Hjelm M, Zhang YT, Tsui HT. Telemedicine: a pilot study in nursing home residents. Gerontology 2001; 47:82-87. **CHINA**	To assess the feasibility of telemedicine in providing geriatric services to nursing home residents, and whether this mode of care resulted in increased productivity and savings.	Non experimental feasibility study. Productivity gains, consumption of hospital services and user satisfaction was measured. Teleconferencing replaced conventional geriatric services. SoE: Poor	Cost analysis of: conventional outreach services, hospital-based clinics, telemedicine and utilization of emergency room and inpatient services. User satisfaction was measured using a 5 point likert scale.	A 200 bed nursing home covered by the CGAT (community geriatric assessment team). Home was chosen because it had no visiting GP and higher than average AED attendance rate of 13.7 per 100 residents per month in 1998, which had risen from 11.5 at the time the home opened in 1994.	Identical polycom video cameras were installed at the nursing home and the local convalescent hospital where the CGAT was based. It is a real-time, two-way video link. During a 1 year study period, the telemedicine operated on Monday to Friday during office hours. After every consultation, the specialists recorded in a questionnaire whether telemedicine was able to replace precious outreach or outpatient activities, and commented on any difficulties encountered. A face-to-face consultation would be conducted on or before the next working day if the user felt that the consultation via telemedicine was inadequate for assessment or management of the patient.	1001 patient episodes using telemedicine over a 12-month period. Occupational therapist 60%, dermatologist 74%, podiatrist 85%, physiotherapist 87%, nurse 89%, geriatrician 95% and psychogeriatrician 99%.

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Jerant AF, Azari R, Nesbitt T. Reducing the Cost of Frequent Hospital Admissions for Congestive Heart Failure: A Randomized Trial of a Home Telecare Intervention. Medical Care 2001; 39(11):1234-1245. **USA**	To compare the effectiveness of three hospital discharge care models for reducing CHF related readmission charges.	Randomized control trial. Two different treatment groups (one with 2-way video conferencing and one with nurse telephone calls). SoE: Good to fair	ANOVA	English speaking patients, age 40 years and older. Inclusion criteria were patients aged 40 and older, had an active telephone line in their home, were English speaking, and had a primary care provider (PCP) in the UCD Health System.	Patients assigned to telephone care received scheduled phone calls from the study nurse in the intervening period, whereas those assigned to the video based group received scheduled home telecare visits.	n=37, randomized to n=13 in home telecare, n=12 in telephone care and n=12 to usual care. Two subjects, both randomized to the telephone group, died during the study.

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Johnson P, Andrews DC. Remote continuous physiological monitoring in the home. Journal of Telemedicine and Telecare 1996; 2:107-113. **UK**	As part of a larger study, they established a remote physiological monitoring network to investigate cardiorespiratory function during sleep. Objective was to link measurements made at three weeks and three months of age with detailed measurements of maternal and fetal nutrition during pregnancy and subsequent outcome.	Descriptive. SoE: Poor	none mentioned	400 from a total of 1000 primiparous mothers (half were smokers) volunteered.	Participants agreed to have detailed plasma micronutrient measurements at 16 and 32 weeks of pregnancy, coupled with detailed dietary questionnaires, and anthropometric measurements at birth. They also agreed to a serial studies at home of cardiorespiratory function during their infants' sleep after birth. Study used continuous, non-invasive cardiorespiratory and behavioral monitoring.	Of 800 overnight studies on 64 (of 400) infants, 99 were completed.

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Johnston B, Wheeler L, Deuser J, Sousa KH. Outcomes of the Kaiser Permanente Tele-home health research project. Arch Fam Med 2000; 9:40-45. **USA**	To evaluate the use of remote video technology in the home health care setting as well as the quality, use, patient satisfaction and cost savings from this project.	Quasiexperimental study conducted from May 1996 to October 1997. Patients were randomized into control or intervention groups, but were not matched for characteristics. SoE: Fair	Chi squared was used to determine differences between control and intervention groups by sex, ethnicity, primary diagnosis, source of referral, and prior home health care experiences. Quality indicators were analyzed using the Fisher exact test. Mann-Whitney test was used to evaluate the utilization data, health status, direct costs, and number of phone visits.	Patients diagnosed as having congestive heart failure. Both control and intervention groups had comparable demographic characteristics. Inclusion criteria for the study were those patients having congestive heart failure, chronic obstructive pulmonary disease, cerebral vascular accident, cancer, diabetes, or secondary diagnosis of anxiety and those needing wound care were eligible for the study. Additional criteria were a plan of care for 4 or more weeks of care and a projected need for 2 or more visits per week.	Both groups received an initial assessment at home as well as a standardized care plan. The intervention group received video visits in addition to in-person and telephone visits. The control group had access to routine home health care.	n=212 n=102 in the intervention group n=110 in the control group.

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Jones K. Gilbert P. Little J. Wilkinson K. Nurse triage for house call requests in a Tyneside general practice: patients' views and effect on doctor workload. British Journal of General Practice 1998; 48:1303-1306. **UK**	To survey the views of patients encountering the nurse triage system for home visit requests, set up in June 1995, and to plot its effect on the routine visiting workload of doctors, and thus their availability at the surgery.	Non-experimental. Questionnaire for self-completion was sent to all those requesting a routine weekday house call during the two four week periods in 1995 and 1996. SoE: Poor	For comparison purposes, , the average total number of home visits made by practice doctors per week was computed for the four periods January to June 1995, July to December 1995, January to June 1996, and July to December 1996. All responses to the questionnaire were coded and analyzed using Microsoft Excel.	From the beginning of September 1995 until the end of December 1996, a total of 1927 house call requests were logged. First postal survey had 84 respondents from the 121 mailed out. Second had 85 responders from the 113 mailed out.	June 1995 - 3 month introductory trial. House call requests received by telephone at the surgery between 8.30 and 10.30 (am) channeled through to one of 3 experienced triage nurses. Computerized patient record displayed during the telephone triage process to facilitate the consultation. Call handling: 1) request accepted and doctor visited (later the same day, 2) appointment given for a same day consultation with the doctor, 3) nurse advice given to the patient 4) the caller was passed on to the duty doctor for advice.	First postal survey 121 questionnaires mailed n=84 Second postal survey 113 mailed n=85

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Kobza L. Scheurich A. the impact of telemedicine on outcomes of chronic wounds in the home care setting. Ostomy Wound Management 2000; 46(10):48-53. **USA**	To examine the utilization of telemedicine in situations where wound specialists consulted with the home health nurse in the patient's home regarding care of chronic wounds.	Non-experimental. One group of patients receiving intervention. Post-intervention levels were compared to baseline levels before treatment. SoE: Poor	none mentioned	Criteria for patient selection included the presence of one or more Stage III or IV pressure ulcers, diabetic foot ulcer, venous stasis ulcer, or any patient with orders for a twice-daily dressing change. Surgical wounds and Stage II pressure ulcers were seen upon specific request of the agency.	Equipment to facilitate the telemedicine visit was installed in the patient's home. The primary home care nurse arranged a preset day and time with the telemedicine wound consultant for the visit. On the day of the visit, a real time two-way video visit was made in conjunction with the home health nurse. The patient and wounds were visualized by the wound specialist via telemedicine equipment with the home health nurse present in the patient's home. The patient and wounds were evaluated and recommendations for treatment were made. A plan of care was then generated and forwarded to the home health agency. Patient were seen in this manner one or two times weekly.	n=76 A total of 191 wounds were evaluated and treated.

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Kropf NP, Grigsby RK. Telemedicine for older adults. Home Health Care Services Quarterly 1999; 17(4):1-11. **USA**	To provide a summary of the types and outcomes of community-based telemedicine programs for elderly patients. Practice and policy challenges in telemedicine are discussed.	Descriptive article. SoE: Poor	none mentioned	none	Article discusses the types of telemedicine interventions, such as health maintenance, emergency response, psychiatric and psychological programs, support care to providers. Various types of outcomes have been identified and measured. Impact of patient care, cost comparison to traditional models of care, and service access.	none mentioned

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Mair FS, Wilkinson M, Bonnar SA, Wootton R, Angus RM. The role of telecare in the management of exacerbation's of chronic obstructive pulmonary disease in the home. Journal of Telemedicine and Telecare 1999; 5(1):66-67. **UK**	To examine home care as an alternative to hospital admission in exacerbation's of COPD (chronic obstructive pulmonary disease).	Non-experimental. Pilot study; feasibility study. SoE: Poor	questionnaire; frequencies	Consideration for participation: patients referred to the hospital A&E department whose primary reason for attendance was an exacerbation of COPD and who were referred for possible admission; patients who self-referred to the A&E department with an exacerbation of COPD and who were thought to require admission by the A&E department staff. Exclusion criteria: acute ECG changes, a history of insulin dependent diabetes mellitus, confusion or dementia, decompensated respiratory failure, need for full-time nursing care or intravenous therapy, or insufficient evidence to confirm a diagnosis of COPD after assessment.	As part of their home care package, participants received visits on days 1-3 with additional visits as needed thereafter for two weeks. On these visits the following items were assessed; symptom chart, spirometry, oxygen saturation, temperature and pulse. As part of the feasibility study patients received video-phone visits, via an analogue video-phone, in addition to routine nursing visits.	n=6 4 men, 2 women. Mean age was 62.

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McCullough, A. Viability and effectiveness of teletherapy for pre-school children with special needs. Int J Lang Commun Disord 2001; 36 (suppl):321-326. **IRELAND**	The purpose of the project was to explore the constraints of teletherapy and to evaluate its benefits to patient, carer, and clinician. Would the technology be suitable for the speech and language therapy clinic? Would it enable parents to develop their skills? Would it be reliable and easy to use?	Non-randomized feasibility study. Reports on data collected during the trial stage. Data was collected using a simple survey design to measure user satisfaction, reliability of the system, audio and visual quality and functionality of the system. The questionnaires were given pre-trail, trial and post-trial. SoE: Poor	none mentioned	Four clients and their carers. Three of the children attended a Mencap nursery, and one child attended a mainstream nursery.	Televisits were timetabled by agreement within a secure clinic setting free from interruptions. Children in the Mencap nursery received one nursery televisit and one home televisit per week. The child attending the mainstream nursery received one home televisit per week.	n=4

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Mease A, Whitlock WL, Brown A, Moore K, Pavliscsak H, Dingbaum A, Lacefield D, Buker K, Xenakis S, Telemedicine improved diabetic management. Military Medicine 2000; 165(8):579-584. **USA**	Can telemedicine improve a patient's ability to self-manage diabetes?	Randomized control trial. SoE: Good to fair	Wilcoxon signed-ranked matched pairs test was used for statistical significance at the .05 level.	Diabetic patients. Mean age is 63, with 11 of the participants being men and 7 being women. Exclusion criteria included inability to use equipment, pending surgery, and documented psychiatric history. Patients were excluded from the study if their HbA results from the initial assessment were less than 8.0%.	The equipment used in the treatment group was the Aviva 20/20 and the Aviva 10/10. It incorporated a personal computer. Weekly visits by the case manager and monthly visits by the physicians using telemedicine were monitored for the 3-month study. Included both voice and video interaction. E-mail contact was maintained between the case manager, the internist and the family practitioner.	N=28 Does not mention drop out rates.

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Morlion B, Knoop C, Paiva M, Estenne M. Internet based home monitoring of pulmonary function after lung transplantation. Am J Respir Crit Care Med 2002; 165:694-697. **BELGIUM**	To assess patient adherence with the monitoring, agreement between home and hospital spirometry, intrasubject coefficient of variation (CV) for FEV1 and FEV25-75, and sensitivity of these variables for the detection of acute complications.	Non-experimental. One group of patients receiving intervention. SoE: Poor	Patient adherence was calculated as the number of days with one or with two measurement sessions divided by the number of days on which the patient was able to perform the measurements. Means and Standard Deviations.	19 patients were included in the study within days after discharge from hospital and three patients were included 97-122 d after surgery.	an internet-based infrastructure consisting of a PC-based user-friendly terminal with a keypad and a screen, a modem, and a microspirometer. Patients were instructed to perform one measurement session in the morning and one in the evening. A session consisted of answering a symptom questionnaire and performing one to three forced expiratory maneuvers.	Originally n=22, but two patients died during the study. N=20.

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Naef RW, Perry KG, Magann EF, McLaughling BN, Chauhan SP, Morrison JC. Home blood pressure monitoring for pregnant patients with hypertension. Journal of Perinatology 1998; 18(3):226-229. **USA**	To determine whether automated measurements of blood pressure and pulse in a home setting can be easily accomplished by pregnant women with chronic hypertension.	Non-experimental prospective study. SoE: Poor	Means ANOVA	Pregnant women with chronic hypertension. All had the condition prior to pregnancy. The goal of management was to maintain mean arterial pressure at 95 to 105 mm Hg. Every third pregnant patient with chronic hypertension was selected over a 6-month period to reduce potential bias in severity of disease, age, ethnicity or parity.	All patients were instructed on the use of a Vaso-Plex home blood pressure monitor. They were asked to take their blood pressure and pulse at home four times a day after 10 minutes of rest in the seated position. They were also instructed on several point that might invalidate the measurements. The patients were instructed to off-load their data once a day by calling a toll-free number. The data was stored in a computer at a remote site, and a compilation of readings of blood pressure and pulse was sent to the physician on a weekly basis. Blood pressure was taken in the clinic during each visit with conventional devices.	n=7 Participated in the study for a range of 4 to 18 weeks.

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Noel HC, Vogel DC. Resource costs and quality of life outcomes for homebound elderly using telemedicine integrated with nurse case management. Caremanagement 2000; October:22-31 **USA**	To determine whether telemonitoring a) improved objective and subjective measures of quality of life b) lowered health care costs of homebound elderly patients.	RCT (Pilot study) Cognitive status, functional level, satisfaction with care, and objective and subjective quality of life variables were all measured. SoE: Good to Fair.	2-tailed t-test for 2 independent groups. Means and standard deviations.	Characteristics included gender, age, marital status, race, education, religion. Mean age was 67.5 for the intervention group and 71.6 in the control group. One was female. Inclusion criteria : High resource users with 3 or more chronic/complex conditions (CHF, Diabetes, COPD), 3 or more hospitalizations or 6 or more emergency room visits, and active home healthcare services.	Patients in the intervention group received 24 hour telemonitoring for initial 3 month phase, and intervention and control groups received nurse case management throughout the 6 month study.	N=20 to begin n=19 n=9 in control n=10 in intervention One death occurred in the control group during the study. Was not included in the analysis.

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Ostbye T, Hurlen P. The electronic house call: consequences of telemedicine consultations for physicians, patients and society. Arch Fam Med 1997; 6:266-271. **NORWAY**	Discuss implications of telemedicine widespread use among physicians, patients and society as a whole.	Descriptive article. SoE: Poor	none mentioned	none mentioned	Discusses the broader economic, legal and political consequences of the widespread use of telemedicine technology.	none

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Perry Britton B, Keehner Engelke M, Rains DB, Mahmud, K. Measuring costs and quality of telehomecare. Home Health Care Manage Prac 2000; 12(4):27-32 **USA**	Describes the strategies employed by an existing Telehomecare program to document the outcomes of Telehomecare.	Case studies of a home care agency. Refers to data that this home care agency uses in order to evaluate the effectiveness of telehome care. SoE: Poor	Minimal description of loft savings and outcomes for one pregnancy induced hypertension case and 13 cases of stage 4 CHF.	Uses as its case study a full service, medicare-certified home care agency that serves 29 counties. Provides some detail for AT & CHF case studies.	No intervention. Article shows how the health care agency documents and customizes Telehomecare data.	n/a

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Phillips VL, Temkin A, Vesmarovich S, Burns R, Idleman L. Using telehealth interventions to prevent pressure ulcers in newly injured spinal cord injury patients post-discharge: results from a pilot study. International Journal of Technology Assessment in Health Care 1999; 15(4);749-766. **USA**	To determine which of the three approaches to care produces the lowest incidence of pressure ulcers, promotes the most effective care of sores that develop, and leads to the fewest hospitalizations in newly injured patients with spinal cord injury after discharge.	Three groups Telephone, video and standard care groups. Matched control were recruited for both the telephone and standard care groups. SoE: Fair	Data on participant characteristics were analyzed using the Krushall-Wallis rank sum test and k-sample chi-square tests for continuous and categorical variables, respectively. Outcome data were analyzed using Friedman's test to investigate response differences for multiple treatments applied to a series of subjects.	Patients with newly injured spinal cords were recruited from the Shepherd Center from May through to October of 1996. The restrictions on participation in the study were few. Participants had to be scheduled for discharge to the community, and they had to have a telephone in their home. In addition, all patients in the video group had to be Georgia residents since nurses at the facility were not licensed at that time to practice in other states. Participants in the video group were recruited first.	Both the video and the telephone group received weekly interventions for 10-12 weeks. In the video group, patients participated in weekly counseling sessions using the AT&T Picasso Still-Image video unit for the first 6-8 weeks following discharge. Appointments were scheduled with the telemedicine nurse coordinator. A driver trained in the use of the unit traveled to the patients house on the appointed day and set up the equipment for the session.	A total of 37 participants were originally recruited. Two dropped out shortly after recruitment, one in the telephone group and one in standard care. N=35 Most patients remained in the study for 7 months.

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Phillips VL, Vesmarovich S, Hauber R, Wiggers E, Egner A. Telehealth: reaching out to newly injured spinal cord patients. Public Health Reports 2001; 116:94-116. **USA**	Telehealth interventions to reduce the incidence of secondary conditions among people with mobility impairment resulting from spinal cord injury.	Randomized control trial. Follow-up telephone interviews collected the outcome-related data. SoE: Good to fair.	Due to small sample size, data was analyzed using non-parametric methods (ie the Kruskall-Wallis test for independent samples).	Average age of the sample was 35 years and did not very significantly across groups. Sex and race did not vary significantly by group. Any patient from 18 to 60 years of age with a newly acquired spinal cord injury was eligible. Patients were excluded if they had a concomitant diagnosis of a brain injury, known active substance abuse, or if their level of mobility impairment level was mild. Participants also had to have a telephone and be discharged to the community, or to day hospitals.	Patients received either video based intervention for 9 weeks, telephone intervention for 9 weeks, or standard follow-up care. Participants were followed for at least one year, to monitor days of hospitalization, depressive symptoms and health-related quality.	Video intervention group n=36 Telephone intervention n=36 standard care n=39

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APPENDIX H: CRITIQUE TELE-HOMECARE

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Piette JD, Weinberger M, Kraemer FB, McPhee SJ. Impact of automated calls with nurse follow-up on diabetes treatment outcomes in a department of veterans affairs health care system. Diabetes Care 2001; 24(2):202-208. **USA**	Evaluation of automated telephone disease management (ATDM) with telephone nurse follow-up as a strategy for improving diabetes treatment processes and outcomes in the Department of Veterans Affairs (VA) clinics.	Randomized control trial. Telephone surveys were used to measure patient's self-care, symptoms, and satisfaction with care. Patients were randomized using sealed envelope containing group assignments. SoE: Good	Despite randomization, intervention and control groups were not equivalent at baseline with regard to patients race and number of diabetes complications. To adjust end point measures for these differences, as well as for baseline values of each end point, the researchers fit multivariate least-squares and logistic regression.	Intervention and control groups had similar characteristics at baseline. However, intervention patients were more likely than control patients to be white and have somewhat more complications. Patients were excluded if they were older than 75, were mentally ill, had a life expectancy of less than 12 months, were newly diagnosed, planned to discontinue receiving services from the clinic within the 12-month follow-up period, or did not have a touch-tone telephone.	During the one year study period, patients in the intervention group received biweekly ATDM health assessment and self-care education calls, and a nurse educator followed up with patients based on their ATDM assessment reports.	A total of 489 patients were eligible. N=272 No mention of any drop-out cases.

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Rogers MAM, Small D, Buchan DA, Butch CA, Stewart CM, Krenzer BE, Husovsky HL. Home monitoring service improves mean arterial pressure in patients with essential hypertension. Annals of Internal Medicine 2001; 134(11):1024-1032. **USA**	To determine the efficacy of a telecommunication service in reducing blood pressure.	Randomized controlled trial that used 24 hour automatic ambulatory blood pressure (ABPM) measurements at baseline and at exit to determine change in blood pressure more accurately. SoE: Good	The primary end point was the change in mean arterial pressure during the trial (baseline to exit) for home service compared with the usual care. Univariate analysis was performed to determine the distribution of the variables and presence of outliers. Paired t-tests were used to compare mean baseline and exit pressures, while t-tests for independent samples were performed to assess differences in means between the two study groups. Pearson chi-squared test used for hypothesis testing of categorical data when the number in each cell exceeded 5. Otherwise Fisher test was used. Logistic regression was also used.	Outpatients were recruited by 5 internists. Ages of the patients ranged from 34 to 86. Only the differences in body mass index was statistically significant. Patients receiving home service were, on average, more overweight than patients receiving usual care. Patients with diabetes mellitus, heart disease, stroke, nephropathy, peripheral arterial disease, or hypertensive retinopathy, an office diastolic pressure of at least 85 mm Hg was a criterion for eligibility. Patients who were younger than 18 years of age, were pregnant, had secondary hypertension, or did not have the mental or physical capacity to monitor blood pressure at home were excluded.	The intervention was a telecommunication service consisting of three components: automatic blood pressure recording at home, central processing and electronic reports provided weekly to the primary physician and patient. Patients assigned to usual care were treated for hypertension according to the guidelines of the Joint National Committee on Prevention, Detection and Treatment of high blood pressure.	n=121 (60 to home service and 61 to usual care). Of those randomly assigned, 93% receiving home service and 90% receiving usual care completed the trial. Trial lasted 8 weeks. 167 patients were identified as possible candidates. 121 were found to be eligible.

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Rooney EM, Studenski SA, Roman LL. A model for nurse case managed home care using televideo. JAGS 1997; 45:1523-1528. **USA**	To determine the feasibility of implementing a home care program, utilizing two-way interactive televideo, as a lower cost alternative to traditional home-care.	Non-experimental. Standardized patient selection was not possible due to constraints. SoE: Poor	not specified. Means	Patients were selected from multiple referral sources, based on informal assessment of potential home care needs or perceived benefits. Inclusion criteria were: to have two or more chronic diagnosis, have four or more active medications, be under the care of a physician who approves the plan, and be willing to consent to participate. Exclusion criteria included terminal conditions less than 6 months, patients requiring daily skilled nursing invasive procedures, severe mental health condition, substance abuse, patient or caregiver inability to follow instructions, and inability to position in front of the monitor.	Patients were contacted a mean number of 4 times per week for 12.5 minutes per encounter.	

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Author/ Article Title/ Year/ Country	Purpose/ Objectives	Design	Analysis	Participants: age/ gender/ groups	Intervention/ Duration	Follow-up: sample size; dropout
Ruggiero C, Sacile R, Giacomini M. Home telecare. Journal of Telemedicine and Telecare 1999; 5:11-17. **ITALY**	Description of various aspects of home telecare.	Descriptive article. SoE: Poor	none mentioned	none	Discusses various reasons for introducing home telecare, the applications of home-based technology, requirements for technology support, and touches on various examples of illnesses and home-based technology.	none

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Author/ Article Title/ Year/ Country	Purpose/ Objectives	Design	Analysis	Participants: age/ gender/ groups	Intervention/ Duration	Follow-up: sample size; dropout
Shah NB, Der E, Ruggerio C, Heidenreich PA, Massie BM. Prevention of hospitalizations for heart failure with an interactive home monitoring program. American Heart Journal 1998; 135:373-378. **USA**	Whether a less intensive program with patient education materials, automated reminders for medication compliance, self-monitoring of daily weights and vital signs, and facilitated telephone communication with a nurse-monitor could reduce hospitalization and whether this benefit could be extended to younger outpatients.	Non-experimental. The number of hospitalizations and hospital days during the mean value at 8.5 months in the program was compared patient by patient with the number during the equivalent period before entrance in the program. SoE: Poor	The primary efficacy end point of this study was the number of hospitalizations and hospital days during the follow-up period compared with the same time period before entrance in the program. The statistical significance was determined with the Wilcoxon 's sign test (due to the distribution not being normal).	Participants were all males who had the diagnosis of CHF. Average age was 62. Enrollment criteria included clinical evidence of CHF for at least 6 months, therapy with angiotensin-converting enzyme inhibitors, unless contraindicated, for a minimum of three months, and left ventricular systolic dysfunction as indicated with left ventricular ejection fraction less than or equal to .35 by means of radionuclide angiography or echocardiography.	All patients were mailed at weekly intervals educational materials for the initial 8 weeks. The patients were given a digital sphygmomanometer, digital weight scale, alphanumeric pager and were instructed on the use of these devices by a nurse. Patients were contacted by phone once a week by the nurse to ascertain their clinical status and to collect the physiologic data. Patients were given 24 hr telephone access to a nurse to report changes in medical condition.	N=27 There were no drop-outs over the one year period of the study.

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Srikanthan VS, Pell ACH, Prasad N, Tait GW, Rae AP, Hogg KJ, Dunn FG. Use of fax facility improves decision making regarding thrombolysis in acute myocardial infarction. Heart 1997; 78:198-200. **UK**	To evaluate a system whereby out of hours ECG's can be faxed to the consultant to aid in decision making regarding thromboytic treatment.	Non-experimental. Fax machines installed in the coronary care unit and in the home of the consultant on call for the unit. Nine senior house officers (SHO's) and 4 consultants participated. SoE: Poor	none mentioned.	Patients with chest pain of cardiac origin arriving at the hospital out of working hours (1800 to 0800) who were admitted to the coronary care unit from May to December 1995.	The admitting SHO took a history, performed a clinical examination, and interpreted the 12 lead ECG. The guidelines for ECG diagnosis of MI were based on standard criteria. A copy of the ECG and the proforma was faxed to the consultant who immediately interpreted the ECG and discussed management by telephone with the SHO. Appropriate treatment was instituted.	n=112 males n=62 females n=50

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Author/ Article Title/ Year/ Country	Purpose/ Objectives	Design	Analysis	Participants: age/ gender/ groups	Intervention/ Duration	Follow-up: sample size; dropout
Subirana Serrate R, Ferrer-Roca O, Gonzalez-Davila E. A cost minimization analysis of oncology home care versus hospital care. Journal of Telemedicine and Telecare 2001; 7:226-232. **SPAIN**	To examine the economic cost-minimization of telephone-supported home care versus hospital care.	Quasi-experimental study. Two groups, control and treatment group (however, they were not randomized into their respective groups). Direct costs were evaluated, as well as the costs derived from the medical doctors and support staff. Cost comparison was based on the variable costs paid by insurance companies. SoE: Poor	Statistical comparison was carried out using Student's T test on mean values and chi squared of case distribution.	Two groups of oncology patients. The control group comprised a retrospective series of successive patients treated in hospital. The treatment group comprised all prospective patients who fulfilled the following selection-criteria: 1. Need for hospital care 2.in receipt of medical care which could be delivered at home. 3.intervals between parenteral treatment greater than 8 h. 4.acceptance of terms by both patient and family	Medical attention at home consisted of two services: home visits and 24-hour telephone support from a doctor, and/or hospital-like care by a specialized nurse team dispensing specific treatments. After the 24h telephone support was established, the details of the types of call made and medical intervention was recorded in a log.	n=20 control group n=10 treatment group n=10 There were two kinds of treatment groups. One group received home hospitalization only, n=6, and the others received home hospitalization n=4 January to October 1997

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Author/ Article Title/ Year/ Country	Purpose/ Objectives	Design	Analysis	Participants: age/ gender/ groups	Intervention/ Duration	Follow-up: sample size; dropout
Tang P. Venables T. Smart homes and telecare for independent living. Journal of Telemedicine and Telecare 2000; 6:8-14. **UK**	To discuss and review different kinds of telecare.	Descriptive article. SoE: Poor	none mentioned	none	No intervention.	none mentioned

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Author/ Article Title/ Year/ Country	Purpose/ Objectives	Design	Analysis	Participants: age/ gender/ groups	Intervention/ Duration	Follow-up: sample size; dropout
Tsang MW, Mok M, Kam G, Jung M, Tang A, Chan U, Chu CM, Li I, Chan J. Improvement in diabetes control with a monitoring system based on a hand-held, touch-screen electronic diary. Journal of Telemedicine and Telecare 2001; 7:47-50. **CHINA**	Aim was to allow diabetic patients to have 24 hour access to a hospital based diabetes monitoring system (DMS) via a hand-held electronic diary's To see if the usage would educate and reinforce patient's dietary knowledge. Immediate feedback was expected to motivate the patients to take part in the management of their diabetes, which in turn might improve their blood sugar control.	Randomized selection to one of two groups. Questionnaire used to assess satisfaction with and acceptability of the DMS to the patient, as well as regularity of use and any technical problems.	Paired t-test	Diabetic patients Group 1 had the DMS for the first 12 weeks, then a control period of 12 weeks. Group 2 had a control period for the first 12 weeks, then used the DMS for 12 weeks.	Each patient was given an electronic diary and modem. Patient was taught how to log on to the DMS and how to record the dietary data. Study lasted 6 months. There was a trial period of two weeks before the start of the study. During this run-in period and during the study period patients had free, 24-hour access every day to the DMS via a telephone connection. They were asked to access the system twice each week. During the control period, patients had conventional follow-up consultations with the diabetes team and did not use the DMS.	N=20 (10 in each group). One participant failed to complete the study because he defaulted during follow-up. DMS-Control: n=10 Control-DMS: n=9

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Wasson J, Gaudette C, Whaley F et al. Substituting Clinician-initiated telephone calls for clinic visits. ACP Journal Club 1992; July/August:30 USA	To examine the effects of substituting clinician-initiated telephone calls for some clinic visits on medical care usage and patient health. ACTION refers to Assisting Carers using Telematic Interventions to meet Older Person's Needs.	Randomized control trial with 2-year follow-up. SoE: Good	Patient satisfaction and functional status were measured at baseline and at study end. Data on prescribed medications, tests, procedures, and hospitalizations were extracted from computerized records.	Men who were ambulatory and lived within range of the clinic. Excluded: patients who had not used the clinic for 6 months, could not read or use the telephone, had only psychiatric or alcohol abuse problems, or required regular injections or blood tests were excluded.	Initial visit by clinician. For control patients (usual care) an appointment was made. For the intervention group, a clinic appointment was made with twice the recommended time interval, and 3 intervening clinician-initiated phone calls were scheduled. Clinicians were provided charts and prescriptions of patients.	N=497, all equal to or over the age of 54. 2 yr. follow up.

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Whitten P, Mair F, Collins B. Home telenursing in Kansas: patients' perceptions of uses and benefits. Journal of Telemedicine and Telecare 1997; 3(1):67-69. **USA**	Description of several phases of a research project involving elderly patients.	Descriptive. Qualitative interviews. SoE: Poor	Thematic content analysis	Phase 1 had 22 subjects. During phase 2, all original 22 were contacted, but only 9 were still receiving home health services. Inclusion criteria for the home health project: patient under physician care, residence in the appropriate geographic service area, met a medical needs test, and provided informed consent. Exclusion criteria: terminal condition, necessity for daily invasive procedures, or inability to follow-simple instructions.	A cable television-based interactive video system was used Telephone interviews were performed using a 17-item, open-ended interview guide. Phase 1 took place after a patient had received a minimum of 5 telenursing visits and phase 2 occurred after a further three months had elapsed.	n=22 phase 1 n=9 phase 2

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Williams G. Doughty K. Bradley DA. Safety and risk issues in using telecare. Journal of Telemedicine and Telecare 2000; 6:249-262. **UK**	Discusses the assessment of home-based technology under three categories: 1. Human factors 2. Environmental factors 3. Technological factors.	Descriptive study. SoE: Poor	none mentioned	none mentioned	Discusses various levels of assessments, such as whether it is safe for a client to remain home at all, safety of carers, the immediate community, the equipment, and the premises.	none mentioned

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Wilson LS, Gill RW, Sharp IF, Joseph J, Heitmann SA, Dadd MJ, Kajan A, Collings AF, Gunaratnam M. Building the hospital without walls-a CSIRO home telecare initiative. Telemedicine Journal 2000;6(2):275-281. **AUSTRALIA**	Description of the Hospital Without Walls project that aims to provide a continuous monitoring of patients in certain diagnostic categories.	Descriptive article. SoE: Poor	none mentioned	none	This project has elected to include continuous monitoring for specified services provided in the home. Continuous monitoring allows the diagnosis of conditions requiring the inspection of long-term, continuous trends. It also ensures the capture of data from intermittent episodes, which cannot be reproduced from episodic visits. In addition, it allows for the opportunity of emergency intervention when the patient is unable to summon for help. The technology requires no specific infrastructure, with the exception of a telephone line and power outlet. It needs to record vital signs continuously within the home and in the immediate environment, but requires limited skill level. There must be an external facility capable of recording, inspecting and disseminating and acting on information.	none mentioned

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Wootton R, Loane M, Mair F, Allen A, Doolittle G, Begley M, McLernan A, Moutray M, Harrisson S. A joint US-UK study of home telenursing. Journal of Telemedicine and Telecare 1998; 4(1):83-85. **UK**	To explore the potential for telemedicine in the provision of home-based care. Explores the similarities and differences between the US and UK in the home nursing environment, using a common methodology.	Non-experimental. Collaborative, multi-center project. Retrospective review of nursing notes. SoE: Poor	Uses an abstraction instrument developed and tested in the US. The abstraction instrument specifically addressed the following issues: 1. Assessment of vital signs tabulation and documentation of the physical examination. 2. Presence or absence of an educational component. 3. evaluation of the procedures performed. The abstraction instrument addresses the following features: objective assessment of vital signs, teaching, and interventions performed such as venipuncture, wound care, or other hands-on activities.	Nursing notes from three different home health agencies were randomly selected for review between January and July 1996 (US). In the UK, "inactive" notes from a group practice in Liverpool, with a patient population in excess of 8000, were randomly selected and reviewed in 1997. In the UK, district nursing data from the Liverpool group practice were also reviewed to explore the likely utility of telemedicine in this context. An analogue video-phone was installed in the home of a 67-year-old woman with hypertension and diabetes. A similar phone was installed in a local health centre in Belfast.	Nursing records were scrutinized to obtain basic demographic data and information regarding nursing activities performed at each visit. Ultimately, based on the overall review, a judgement as to whether the visit could have been conducted via telemedicine was made. In addition, the abstraction instrument specifically addressed the question of whether or not the visit could have been done via telemedicine.	1700 episodes of patient care were reviewed. N=906 in US n=839 in UK US sample consisted of 614 female subjects and 286 male subjects. UK sample consisted of 20 female subjects and 16 male subjects. The number of visits per patient ranged from 2 to 166, with an average of 23.

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Wootton R, Loane M, Mair F, Moutray M, Harrisson S, Siivananthan S, Allen A, Doolittle G, McLernan A. The potential for telemedicine in home nursing. Journal of Telemedicine and Telecare 1998; 4:214-218. **UK**	Assessment of the proportion of nursing home visits that could be replaced by home telenursing in the UK.	Non-experimental. Retrospective review of "inactive" notes using an abstraction instrument. Computerized district nursing activity data from the same group were reviewed. Pilot test. SoE: Poor	Scrutiny of nursing records. Likert scale was used in the pilot study. Visits were categorized as being unsuitable for telemedicine, suitable for telemedicine, or those in which a determination was uncertain without further clinical information. The "snapshot" data was compared with those obtained by the retrospective review of individual patient notes. If the results were similar, this would be reassuring and confirm that the results had not been unduly biased by information from patients who had large numbers of visits.	Sample population n=81 n=50 women n=31 men A total of 1951 episodes of patient care were reviewed. Average of 17 visits per patient (Belfast) Average of 27 visits per patient (liverpool). Inclusion criteria for using the notes were: that district nursing care had been received between 1 January and 30 June 1997, and that treatment had been completed.	For the pilot study, an analogue video-phone was installed in the home of a 67-year-old female patient with hypertension and diabetes. A similar video phone was installed in the local health centre in west Belfast, approximately 1 km away. After each call, the approximate call duration was noted in nursing log.	n/a

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Zelickson BD, Homan L. Teledermatology in the nursing home. Arch Dermatol 1997; 133:171-174. **USA**	To examine a still image store and forward teledermatology system for use in the care of nursing home residents.	Non-experimental. Diagnosis and treatment plans made from a teledermatology system were compared with those made from an on-site dermatology consultation. SoE: Poor	Cost analysis was performed based on time spend by the nurse collecting and sending patient information and average dermotologic consultation fees within the minneapolis metropolitan area. Chi squared was the statistical analysis used.	All nursing home resident consultation requests from a Health Care Centre were eligible for the study. Thirty skin disorders were enrolled on a first-come basis. Eighteen conditions were considered eruptions and 12 were considered lesions.	The nurse collected images of the coetaneous findings at the patients' bedside. Two to four still images were selected from the videotape by the nurse and sent via the still-image telephone to the dermatologist. The history from was faxed to the dermatologist. Two dermatologists independently made a preliminary diagnosis and treatment plan after viewing the images alone and then again after reading the faxed histories. The faxed patients were also sent to 3 separate dermatologists for an independent diagnosis and treatment plan. The physician also recorded if they felt that there was insufficient data to make a diagnosis or treatment plan.	n=29 patients (n=30 skin disorders). Only 7 of the patient/guardian satisfaction surveys were returned.

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Zhang Y, Zhou JB, Dai B, Cui Z, Lin J, Ding C, Zhang P, Yu B, Ye L, Shen D, Zhu Z, Zhang J, Ye D, Zhou L. first trial of home ECG and blood pressure telemonitoring system in Macau. Telemedicine Journal 1997; 3(1):67-72. **CHINA**	To determine the feasibility of home monitoring of patients with cardiac disease or hypertension.	Non-experimental. Evaluation of telemonitoring at home of cardiac and hypertension patients. SoE: Poor	Frequencies	10 patients were selected by a physician as the first user group for the system. 9 patients had coronary artery disease, and one patient had rheumatic heart disease. 6 of the patients were hypertensive.	The home ECG and BP telemonitoring system has three components, a monitoring center in the hospital; ECG and BP monitoring devices in the user's home and a telecommunication link between the home devices and the hospital monitoring center using the public telephone network. When the patient has symptoms, he/she can send the real-time ECG data to the hospital by striking a computer key. Program operated for three months.	none mentioned.

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APPENDIX H: CRITIQUE TELE-HOMECARE

Author/ Article Title/ Year/ Country	**Outcomes/ Socio-Economic Indicators**	**Methodological Problems**	**Policy Recommendations**	**Applicability to Alberta**
Alemi F, Stephens R, Parran T, Llorens S, Bhatt P, Ghadiri A, Eisenstein E. Automated monitoring of outcomes:application to treatment of drug abuse. Med Decis Making 1994; 14:180-187. **USA**	The follow-up rates for the computer interviews were systematically higher than the follow-up rates for the written questionnaire. At weeks 5, 11, 15 and 19 the computer interview rates were 78.6%, 59.5%, 38.1% and 19.1% respectively. In comparison, the rates for written questionnaires for the same weeks were 14.3%, 16.6%, 14.3% and 2.4% lower than the computer interview rates. Data suggests that in an average week, participation for the computer interviews exceeded participation for the written questionnaires by 11.9%	Ethical problems. The participants were under the impression that the counselors were receiving their answers. The monetary incentive for completion of computer and written questionnaires are a possible biasing factor. Counsellors presented the questionnaires as homework assignments.	Need to determine if the system can be implemented into a treatment program where the usual expectation would be that clients would continue to interact with the computer as a required part of an aftercare regimen. Relapse probabilities are instantly calculated and can be immediately forwarded to treatment personnel in order to assist them in deciding whether therapeutic intervention is appropriate.	Limited.

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Author/ Article Title/ Year/ Country	**Outcomes/ Socio-Economic Indicators**	**Methodological Problems**	**Policy Recommendations**	**Applicability to Alberta**
Allen A, Doolittle GC, Boysen CD, Komoroski K, Wolf M, Collins B, Patterson JD. An analysis of the suitability of home health visits for telemedicine. Journal of Telemedicine and Telecare 1999; 5:90-96. **USA**	Coders judged that 412 of the home health visits were appropriate for telemedicine interactions using currently available telenursing and telemonitoring technologies. Analysis showed that the patient's age, the number of interventions made by the home health nurse, and the patient's diagnosis significantly influenced the judgement of whether a specific home health visit could be conducted using telemedicine. Older patients were judged to be better candidates for telemedicine care than younger patients.	Retrospective study, not useful for prediction. Data gathered solely from home health medical records. Is this a representative sample? Consistencies in written medical notes could not be assured.	Two principal criteria must be met before telemedicine can be used to provide medical care in the home. 1)home health patients or their on-site caregiver must be able to manipulate telemedicine equipment and diagnostic apparatus such as electronic blood pressure cuffs. 2)the patient should require no more than one intervention, and the intervention should not involve venepuncture, intravenous placements or wound care.	Some. Technological advances will alleviate some of the issues raised through this study.

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Author/ Article Title/ Year/ Country	**Outcomes/ Socio-Economic Indicators**	**Methodological Problems**	**Policy Recommendations**	**Applicability to Alberta**
Artinian NT, Washington OGM, Templin TN. Effects of home telemonitoring and community based monitoring on blood pressure control in urban African Americans: A pilot study. Heat and Lung 2001; 30(3):191-199. **USA**	The hypothesis was supported. SBP and DBP for patients in both experimental groups dropped significantly during the three month period. The effect size (at least a 5-6 mm Hg reduction in DBP) has the potential to reduce morbidity and mortality and produce and effect similar to that produced by and antihypertensive drug. The home telemonitoring group did slightly better, but not significantly so, than the community group.	Small sample size, and the sample was a convenience sample as opposed to a random sample.	These potential intervention effects translates into cost-savings through reducing the number of drugs necessary to achieve BP control or reducing HTN complications.	Yes. Hypertension is a common illness. Potential application for consideration.

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Barbaro V. Bartolini P. Bernarducci R. a portable unit for remote monitoring of pacemaker patients. Journal of Telemedicine and Telecare 1997; 3:96-102. **ITALY**	In both reports, the system recognized the type of implant (dual chamber) and acquired its characteristic parameters: amplitude, duration and pulse decay time constant for each chamber, stimulation period, heart rate in beats per minute, and the atrial-ventricular delay between the two pulses.	Not empirical study. Descriptive	Elderly patients will probably encounter some difficulties if they are to carry out a complete check by themselves, since special care has to be taken when applying the electrodes to the limbs and positioning the magnet close to the pacemaker pocket. It should be pointed out that as far as safety is concerned, a full check, which used a magnet on the pacemaker, can pose a risk to certain patients.	No. Technology has since advanced.

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Author/ Article Title/ Year/ Country	Outcomes/ Socio-Economic Indicators	Methodological Problems	Policy Recommendations	Applicability to Alberta
Biermann E, Dietrich W, Standl E. Telecare of diabetic patients with intensified insulin therapy. Medical infobahn for Europe, A. Hasman et al (eds) 2000:327-332. **GERMANY**	The diabetic patients with multiple injection insulin therapy produces similar results in comparison with conventional care, if the quality of care parameters are considered. HbA1 levels dropped in both groups.	Need a larger sample. Control and Intervention group not matched evenly.	The same amount of metabolic control can be achieved by telemedical advice. On the patient side, there is a substantial amount of time and cost (travel and time off work) that can potentially be saved by using telecare. Telemedical care can improve the quality and cost effectiveness of the overall monitoring / therapy revision process of patients with diabetes mellitus. Greater clinician time required for telecare. This may alter with application and increased familiarity, but must be considered in the short term.	Yes. Demonstrates value of assisting diabetics to help themselves. [Note current SLICK program within Alberta].

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Author/ Article Title/ Year/ Country	Outcomes/ Socio-Economic Indicators	Methodological Problems	Policy Recommendations	Applicability to Alberta
Black S. Andersen K. Loane MA. Wootton R. The potential of telemedicine for home nursing in queensland. Journal of Telemedicine and Telecare 2001; 7:199-205. **AUSTRALIA**	A total of 1521 home visits were deemed suitable for telemedicine There was no significant difference between men and women in terms of suitability. There were some differences in terms of suitability between the different age groups, but no consistent pattern, probably because of the small sizes in each goup. Those interventions judged most suitable for delivery of telemedicine were supervision of other staff, review, psychosocial support and education.	Paper mentions the use of narrative comments where necessary, however does not comment on the analysis of those comments, or how they were dealt with, if at all.	The estimate of suitability for telemedicine may be conservative and could be higher if accompanied by changes in work practices. This would involve the delegation of aspects of personal care and some nursing care to second level workers (enrolled nurses) or third level workers (personal care assistants).	Yes. Indicates a low 12% of traditional homecare visits could be done by home telehealth, but implies this figure is conservative.

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Author/ Article Title/ Year/ Country	Outcomes/ Socio-Economic Indicators	Methodological Problems	Policy Recommendations	Applicability to Alberta
Bondmass M, Bolger N, Castro G, Avitall B. the effect of home monitoring and telemangement on blood pressure control among african americans. **USA**	Both systolic and diastolic blood pressure were reduced significantly. Moreover, these significant reductions did not cause any detrimental changes in heart rates, which were within normal limits at baseline. Heart rate monitoring of this patient sample was beneficial in providing the data needed to prevent any prolonged bradycardic or tachycardic responses to drugs with direct or indirect chronotropic effects. Secondary outcomes were weight reduction, medication interventions, disease knowledge, and quality of life.	Sampling problems (some participants referred themselves to the study…how were they recruited?) Small sample size.	The general cardiovascular health of African Americans is relatively poorer and has not improved as much over the past decades, as it has with Caucasians and Hispanics. Implicit in this fact is that more cardiovascular research is needed that focuses on African Americans.	Yes. Potential area of application in hypertension monitoring.

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Bondmass M, Bolger N, Castro G, Avitall B. the effect of physiologic home monitoring and telemanagement on chronic heart failure outcomes. The Internet Journal of Asthma, Allergy and Immunology 1999; 3(2):1-16. **USA**	Positive outcomes at three, six and twelve months post-enrollment; clinical and cost effectiveness demonstrated. 3 months: data for the 58/60 surviving patients indicate a) 81% change in HF admissions, 90% change in LOS for these admissions, and b) 91% decrease in associated hospital charges compared to their respective data for the three months preceding study enrollment. 6 months: 77% change in HF admissions, 86% change in LOS for these admissions, and an 88% decrease in associated hospital charges. Significant improvement in quality of life was demonstrated by a 26% change from baseline. At six and twelve months post enrollment, quality of life continued to remain significantly improved 26%.	Sample size. Research design.	Suggest that the telemanagement method provides a major advantage as either a stand-alone program or as an adjunctive strategy for existing programs. Patients that are very compliant and knowledgeable, without lives complicated by the social/economic issues that can often "de-rail" otherwise compliant patients, most likely would not derive the same cost/benefit ratio.	Yes. Potential application.

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Author/ Article Title/ Year/ Country	Outcomes/ Socio-Economic Indicators	Methodological Problems	Policy Recommendations	Applicability to Alberta
Bruderman I, Abboud S. Telespirometry: novel system for home monitoring of asthmatic patients. Telemedicine Journal 1997; 3(2):127-133. **ISRAEL**	In 19 patients, analysis of the spirometric data detected early signs of asthmatic deterioration, whereas in 20 patients, no early deterioration was present.	How were patients recruited? Small sample. How long was the intervention?	A change in clinical management at the start of the progressive increase in airway resistance may prevent severe exacerbation and MICU dispatch. Oral communication between the patient and the operator is of the utmost importance. In spite of high cost, the telespirometry system may increase the cost-effectiveness of the management of COPD patients by avoiding unnecessary and costly hospitalizations.	Yes. Potential area of application.

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Celler BG, Earnshaw W, Ilsar ED. Betbeder-Matibet L. Harris MF. Clark R. Hesketh T. Lovell NH. Remote monitoring of health status of the elderly at home. A multidisciplinary project on aging at the University of New South Wales. International Journal of Bio-Medical Computing 1995; 40:147-155. **AUSTRALIA**	none, as study has not been completed yet.	Descriptive, as no empirical study has been undertaken as of yet.	Need creation of a knowledge based system to analyze and interpret this data (health status). Links with 'smart' home concept.	Yes. Technology development opportunity

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Celler BG, Lovell NH, Chan DKY. The potential impact of home telecare on clinical practice. MJA 1999; 171:518-521. **AUSTRALIA**	There is strong economic justification for transferring resources from residential to home-based care. Substantial evidence that healthcare outcomes and quality of life improve when healthcare services are home based. Ethical issues arising from home telecare and the storing and accessing of clinical data by multiple providers are complex. First, Second and Third generation systems: first gen systems designed to reduce anxiety among elderly and high-risk patients. Second gen systems can generate alarms without the intervention of the patient, on the suspicion that something may be wrong. Third gen systems attempt to deal with some issues revolving around loneliness and quality of life.	Descriptive study.	Individuals are entitled to assurance that personal information will not be subject to unauthorized access, and will be used only for the purposes it has been collected for. This requires procedures and processes to ensure that personal data can only be accessed by those authorized to do so. For clinicians to become significant participants and leaders in these changes, they will need to become fully integrated in a communications network based on Web and Internet technologies.	Yes. Valuable discourse of relevance to future application of home telehealth.

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Chan M, Bocquet H, Campo E, Val T, Esteve D, Pous J. Multisensor system and artificial intelligence in housing for the elderly. Gerontechnology, A Sustainable Investment in the Future 1998; J. Graafmans et al (eds). IOS Press. **FRANCE**	The system is designed as an aid to carers of elderly patients suffering from loss of autonomy. Warnings are simple, accurate and require no special handling or IT skills.	Not an empirical research study.	Use of 'smart' systems is an area to be more closely examined.	Yes. Potential area of technology investigation and application.

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Chung M, Akahoshi M. reducing home nursing visit costs using a remote access infusion pump system. Journal of IV Nursing 1999; 22(6):309-316. **USA**	During the evaluation period, there were 18 calls or orders for dose changes, which would have required a nurse to visit. Of these calls, 13 home nursing visits were avoided. The use of the remote system saved an average of 1 nursing visit for every 10 patient therapy days. Able to reduce the number of after-hours or unscheduled visits by 72.2% on these selected patients, resulting in a savings of $1690 in measurable nursing costs alone. Other soft-cost savings included more productive use of clinician time. Nurses were able to see more patients during the day, or evening.	Extremely small sample size. Sample not representative.	Ability to access a patient's IV device via remote access is an advantage to the on-call nurse, and reduces the number of on-site vsits required, particularly after-hours visits. May also be a benefit to organizations as far as recruitment of potential new employees and retention of current employees.	Yes. Potential application.

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Cost reengineering report 1999:122-125. USA	Program was successful. Close to 100 patients had been spared transfers to other hospitals. In the first three years of the program, the hospital participants collectively saved $626, 000, largely attributed to reduced air transports, lower intensive care unit costs, and the elimination of OR standby.	Not an empirical study.	For any telemedicine program to be successful, identifying the clinical problem that needs solving must occur before technology is selected. Last ingredient to erecting a successful telemedicine project is the need to provide some benefit to all participants.	Yes. Simple lessons that still elude many applications

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Dansky KH, Bowles KH, Palmer L. How telehomecare affects patients. Caring. 1999:10-14. **USA**	In the focus group, technical problems were identified. The nurses expressed frustration with the number and complexity of technical problems with the telehomecare equipment. The nurses' comments provide insight into the nurse/patient relationship. The technology added patient rapport, and the relationship was viewed as a partnership. Fostered empowerment. In regards to the survey, preliminary analysis indicated that patients were very satisfied with their care. Scales were constructed to represent various dimensions (emotional functioning, physical functioning). Preliminary analysis indicate that both groups show improvement for each scale. However, the video group shows greater improvement in general health.	No mention of sample size. Not clear as to the purpose of the telehomecare (was it placed in the home just to increase general health?). Makes no mention of inclusion or exclusion criteria.	Experience indicates that elderly patients should not be stereotyped as being "computer-phobic". With practice and encouragement, very frail and elderly individuals can use this equipment effectively.	Yes. Helps erode the perception of the elderly as technophobes.

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Dansky KH, Palmer L, Shea D, Bowles K. Cost analysis of telehomecare. Telemedicine Journal and e-Health 2001; 7(3):225-232. **USA**	Telehomecare has the potential to provide the same number of patient encounters at lower cost to the home health agency. Fewer telehomecare patients required recertification after 60 days. 28% of control group patients were hospitalized during the 60 day intervention as opposed to 10% of telehomecare patients.	Minimal details on any statistical analysis that was done. Little discussion on the effects of telehomecare on clinical outcomes. Only costs for registered nurse used in analysis, despite several professionals involved in care (Aide, PT, Social worker).	Potential savings through fewer home visits offset the additional costs that telehomecare imposes to the health agency. Under a prospective payment system, the home health agency can provide more encounters while reducing total contact time.	Yes. Demonstrates potential for cost savings, but analysis limited.

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de Lusignan S, Wells S. Johnson P, Meredith K, Leatham E. Compliance and effectiveness of 1 year's home telemonitoring. The report of a pilot study of patients with chronic heart failure. European Journal of Heart Failure 2001; 3:723-730 **UK**	There were no significant differences between quality of life and chronic heart failure questionnaire scores between the two groups. Video consulting started off with enthusiasm, but became less useful. The video did not seem to offer an advantages over a telephone consultation. The patients would have preferred to see a physician face to face. The 6 week to 3 month period had the most impact on the study group. Compliance with pulses & bp monitoring was 90% and with weight monitoring was 75%. Medication compliance was complex-cost of cardiac drugs fell faster in the control group, but the telemedicine group reduced the cost on non-cardiac drugs by a greater amount than the increased cost for cardiac drugs.	Sample is too small, especially after the drop-out rate. Selection bias	Home telemonitoring is an acceptable reliable intervention. Benefit in terms of compliance with medication and self-monitoring is still seen after 1 year. Careful consideration needs to be given as to which patients will benefit most from this type of monitoring.	Yes. Potential application for consideration.

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Author/ Article Title/ Year/ Country	**Outcomes/ Socio-Economic Indicators**	**Methodological Problems**	**Policy Recommendations**	**Applicability to Alberta**
Demiris G, Speedie S, Finkelstein S. A questionnaire for the assessment of patient's impressions of the risks and benefits of home telecare. Journal of Telemedicine and Telecare 2000; 6:278-284. **USA**	The concern of patients about privacy and confidentiality of their medical data, use and reliability of the required equipment and the generally positive attitude towards home telecare are findings that are in agreement with those in the published literature.	Poor sampling. Small sample. Results are focused on how to write a questionnaire, not on perceptions of home telecare.	Limited.	

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Demiris G, Speedie SM, Finkelstein S. Change of patient's perceptions of telehomecare. Telemedicine Journal and e-Health 2001; 7(3):241-247. **USA**	The data demonstrates that experience with telehomecare leads to a change of patients' perception, and, specifically, in a more positive direction. Patients tend to become more familiar with and confident in technology after participation in a telehomecare system.	Sample size small. Study not clear on how they recruited the sample. Sampling problems.	Findings imply that elderly, often homebound, patients are able to handle the equipment and do increase their confidence in its use as they gain experience with it. Investigating patient perceptions of an innovative health care delivery system before and after they have actually experienced it can enhance the detection factors that contribute to system performance	Yes. Indicates seniors do not have 'technophobia' as is often believed.

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Doolittle GC, Yaezel A, Otto F, Clemens C. Hospice care using home-based telemedicine systems. Journal of Telemedicine and Telecare 1998; 4(1):58-59 **USA**	Patients and caregivers reported general satisfaction with the telehospice system. The nurses and social worker providers became comfortable about video-calls. Nurses conducted video-assessments to determine whether an "in-person" visit was necessary.	Sampling problems (patients chosen only on willingness to participate, no other criteria). Small sample	Hospice care is a sensitive topic, and telehospice may provide an additional mechanism to provide the required support.	Yes, if telehospice purued as a potential application.

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Doolittle GC. A cost management study for a home-based telehospice service. Journal of Telemedicine and Telecare 2000; 6(1):193-195. **USA**	Between January and March 1997, 1832 traditional home visits were made. The total operational cost of traditional hospice care was $231, 613. Between January and March 1998, the telehospice service included telemedicine visits provided by nurses and social workers. During this time, a total of 109 telehospice visits were conducted. There was a total of 599 patient-days of care. Operational costs for the telemedicine service (excluding traditional in-person visit time) were $3165. Expenses fell into two categories; equipment and operational.	Descriptive study	Emphasize that the two visits (telehospice and traditional) are not the same. Telemedicine visits are much shorter, on average less than 10 min.	Yes, if telehospice purued as a potential application.

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Finkelstein SM, Speedie SM, Lundgren JM, Ideker M. Telehomecare: connecting the home and the home care agency. Caring Magazine 2000; July:32-35. **USA**	Focus groups were used to determine the reaction of potential users of home health care to the introduction of virtual visit technology into their homes and daily activities. In the pilot study, Telehomecare was successful with 13 subjects, but was not acceptable in 11 of the cases for a variety of reasons.	Article is basically a descriptive article dealing with the activities and on-goings of the Telehomecare project (a collaboration of home care agencies and the University of Minnesota). Authors conclude too much based on a pilot study of 24 people, 13 of which were successful.	Based on the results of the pilot study, a full study was conducted and completed in the spring of 2001. It is important to realize that it will not be acceptable for every patient.	Yes. Highlights utility in three common areas that could benefit from home telehealth - CHF, COPD, wound healing.

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Gray JE, Safran C, Davis RB, Pompilio-Weitzner G, Stewart JE, Zaccagnini L, Pursley D. Baby carelink: using the internet and telemedicine to improve care for high risk infants. Pediatrics 2000; 106(6):1318-1324 **USA**	The intervention group reported higher overall quality of care. The intervention group reported greater satisfaction with the unit's physical environment and visitation policies. All infants in the intervention group were discharged directly to home whereas 20% of control infants were transferred to community hospitals before ultimate discharge home. CareLink significantly improves family satisfaction with inpatient VLBW care, and definitely lowers costs associated with hospital to hospital transfer. The use of telemedicine and the internet support the educational and emotional needs of the families, which in turn facilitates earlier discharges.	No details how long the telemedicine equipment remained in the intervention group homes. Many kinds of infants were excluded (those infants whose families did not speak english, those infants who were discharged to non-biological parents, or infants who were going to be transferred to another community hospital). There is no rationale given for their exclusion.	Further extension of this model to the postdischarge period will significantly improve the coordination and efficiency of care.	Yes. Potential application for consideration.

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Gritzalis D, Lambrinoudakis C. A data protection scheme for a remote vital signs monitoring healthcare service. Medical Informatics 2000; 25(3):207-224. **GREECE**	There is sensitivity of the information that is stored and processed by HIS (healthcare information system) that imposes essential requirements in respect to the security of the services. Presents in a step-by-step fashion the use of a risk analysis method for calculating risk levels and for managing the risks through the selection of appropriate security measures. Capitalizing on the risk analysis results, a list of security measures for the remote vital signs monitoring service has been compiled as: organizational, procedural and technical security measures that are analogous to the identified security risks.	Descriptive study.	The need for reinforcing security has been identified by healthcare organizations that have developed security plans.	Yes. Of assistance in future policy development.

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Hanson EJ, Clarke A. The role of telematics in assisting family carers and frail older people at home. Health and Social Care in the Community 2000; 8(2):129-137 **UK**	It was perceived by the carers that the ACTION system merely added to the demands of daily care-giving (this being consistent with literature regarding the realities of care-giving). Concerns over privacy were voiced, as well as concerns over the use of technology.	Needs a larger sample size	Opposed to a "blanket" use of the ACTION system. Rather, the findings point to the considered use of such technology with individual family carers and older people in close collaboration with health and social providers in order to ensure that the positive aspects of the technology are fully realized while the negative aspects are kept to a minimum.	Yes. Need to identify those categories or groups of patient and caregivers that could most benefit and not assume valuable to all patients or caregivers all of the time. Essential consideration before implementing a broad-based program.

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Hayes RP, Duffey EB, Dunbar J, Wages JW, Holbrook SE. Staff perceptions of emergency and home-care telemedicine. Journal of Telemedicine and Telecare 1998; 4:101-107. **USA**	The follow-up interviews revealed that the system had not been used in the ED. Only one EMT practiced with the telemedicine system. Only one home-health nurse had been able to use the system with a patient. Training was judged to be inadequate, as well as poor communication between the EMS director and the pilot project coordinator. Another barrier to the system was that it required two nurses to be involved: one to take pictures and another to position the patient.	Unclear sample.	If telemedicine technology is to be introduced as a series of demonstration projects and is not included as an integral part of an organizations strategic plan, then the probability of success for any given telemedicine project decreases significantly. Future research is required into the organizational readiness for the successful implementation of telemedicine.	Yes. Useful discourse that relates to policy issues.

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Health Canada. Tele-homecare consultation workshop. August 7, 1998:1-19. **Canada**	Strong consensus that the federal government should play a leadership role in facilitating consultation with other levels of government and stakeholders, fund world class demonstration projects, increase research funding, consult on intellectual property issues, and sponsor conferences for dissemination of information. Consensus on supporting a broad definition of tele-homecare to ensure that significant opportunities were not overlooked. Must be aware of assumptions of "home". Integration was a strong theme.	A significant opportunity exists for policy makers to take a leadership role to address inequities in the home care sector through active health care reform, a revisiting of the limits of the Canada Health Act. A need to develop a framework that incorporates health care benchmarks for individual health sector and cross sector evaluative purposes. The need for the social impact of tele-homecare needs to be examined.	Yes. Useful discourse that relates to policy issues.	

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Heidenreich PA, Ruggerio CM, Massie BM. Effect of a home monitoring system on hospitalization and resource use for patients with heart failure. Am Heart Journal 1999; 138:633-640. **USA**	Average claims per year during the intervention were significantly lower for the patients in the program. When compared with the year before enrollment (1995), total claims during the intervention were also significantly lower for the patients enrolled in the program compared with control group patients. The average change in total claims from the preintervention to the intervention period was a $1500 decrease for enrolled patients compared with an $8000 increase for control patients. The cost of the program was estimated to be less than $200 per patient per month. Using this upper limit for the cost of the program, the cost per/patient for a year in 1996 was $9800. Most significant drops were for men and patients older than 75. Women and younger patients did benefit, but not reach statistical significance.	Program control group non-randomized. Unable to determine which part of the program was responsible for the observed reduction in resource use.	This program is intended as an aid to, not as a replacement of, physician services. To maintain doctor-patient relationship the program did not contact the physician at the request of the patient. Patients were told to contact their doctors directly if they were concerned about their health.	Yes. Potential application with potential for cost savings.

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Horio H, Murakami M, Chiba Y, Inada H. Fetal monitor for non-stress-test screening at home. Biomedical Instrumentation & Technology 1998; 32:39-47. **JAPAN**	The data transmission errors occurred during transmissions caused by inappropriate software coding in the equipment; after this was corrected in the early stage of the experiment, such errors no longer occurred, and when a "pure" transmission error occurred, the re-transmission was successful. The re-transmission rate in patient handling errors was 82.4% which indicated that the patients usually become aware of the errors and corrected them. The analysis of noise in the NST data indicated that the main cause of noise was zero-count data. The feasibility of using the home fetal monitoring devise was evident in the responses to the questionnaire: almost all the participants who expected to become pregnant again wanted to use this monitor during the pregnancy.	Research design not clear/specified. Not clear as to how sample was generated, or if there were inclusion or exclusion criteria.	Computer networking is becoming common, so that the existing personal computers added to a network interface can immediately be used for the interpretation of NST monitoring data. The cost of fetal monitoring equipment for home use is high now because the market is small. One option is to also use this monitor as a CTG monitor at delivery. Next step is to develop a fetal monitor with detachable units for both home monitoring and in-hospital usage.	Non yet. Feasibility demonstrated only.

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Hui E, Woo J, Hjelm M, Zhang YT, Tsui HT. Telemedicine: a pilot study in nursing home residents. Gerontology 2001; 47:82-87. **CHINA**	For the geriatrician, 97% of routine follow-ups and 90% of urgent referrals could be managed by telemedicine. Telemedicine was cheaper than conventional outreach or outpatient services for all participating disciplines. By replacing the outreach clinic with telemedicine, the geriatrician was able to increase her clinic caseload from 45 to 65 (44.4%) by the end of year 1. Greater flexibility in scheduling more frequent follow-up for unstable patients. The geriatrician spent on average 2.5 h on a telemedicine session compared with 4 h for an outreach clinic. The nursing home reported savings amounting to US 9,510 in transport and escort services to outpatients clinics and AED compared to the previous year.	Lack of discussion regarding analysis, and lack of information regarding subjects.	Telemedicine is safe for managing patients who are well known to the geriatrician, however its use is not recommended for the initial assessment of new patients, as a thorough face-to-face interview and physical examination is mandatory.	Yes. Demonstrates good utility for geriatric care. Potential application.

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Jerant AF, Azari R, Nesbitt T. Reducing the Cost of Frequent Hospital Admissions for Congestive Heart Failure: A Randomized Trial of a Home Telecare Intervention. Medical Care 2001; 39(11):1234-1245. **USA**	Mean total care charges were 68% lower in the home telecare group and 69% lower in the telephone group that in the usual care group (although not statistically significant). Found statistically non-significant but promising differences in average length of hospital stay and total care charges for both intervention groups.	Very small sample size. Predominance of white participants.	Significant reductions in hospital readmissions, ED visits and cost of care for patients with CHF might be achieved by the widespread deployment of posthospitalization home telecare or telephonic nursing supervised by primary care physicians.	Yes. Emphasizes the need to not discount or discard use of simple strategies such as telephone based applications. Also provides a potential application for consideration.

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Johnson P, Andrews DC. Remote continuous physiological monitoring in the home. Journal of Telemedicine and Telecare 1996; 2:107-113. **UK**	Software programs could rapidly search for behavioral patterns and thus classify large volumes of data into clinically useful categories. Allowed specific time-and-behavior related analysis to be performed and verified.	Results section does not adequately (if at all) deal with proposed objective.	Better medicine becomes much more economic because of the greater clinical precision made possible by low-cost sophisticated networked communications.	Yes. Potential area of investigation.

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Johnston B, Wheeler L, Deuser J, Sousa KH. Outcomes of the Kaiser Permanente Tele-home health research project. Arch Fam Med 2000; 9:40-45. **USA**	In terms of home health care visits, the two groups did not differ statistically. Both groups did not differ statistically in regards to compliance with medication regimen, knowledge about their condition, or ability to move toward self-care. The current productivity standards allow one nurse to visit 5 or 6 patients per day. A time study indicated that remote video visits allow 15 to 20 video visits per day.	Claim that results of the pilot study lead to consensus on there being enough evidence to warrant/justify the incorporation of Telehome health, but much of their results were statistically insignificant. Ethnicity is categorized as white vs non-white. Predominance of sample were white	Incorporating this technology into the home health care patient's plan of care as a substitute model should further support potential cost-effectiveness. Early resistance to the concept of Telehome Health can be dispelled as data support positive outcomes for patients.	Yes. Suggests significant potential for increased access and increased efficiency using telehealth.

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Jones K, Gilbert P, Little J, Wilkinson K. Nurse triage for house call requests in a Tyneside general practice: patients' views and effect on doctor workload. British Journal of General Practice 1998; 48:1303-1306. **UK**	Average daily totals of visits performed showed important reductions after the new triage system began. Allowed number of doctors performing weekday routine house calls to be reduced to two or even one instead of three to five, with ~ three extra surgery-based doctor consulting hours made available per day at a cost of two hours of nurse time. Some 68% or more responders in both surveys reported that they had been able to say all they wanted to the nurse, were told all they wanted, found the nurse easy to understand, and were satisfied with the help received.		A wider study is needed to further investigate the cost-effectiveness of using expensive nurse practitioner time instead of receptionist time to allocate house calls and the appropriateness of the calls actually done as a result of nurse triage.	No. Not applicable. Home visits uncommon.

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Author/ Article Title/ Year/ Country	Outcomes/ Socio-Economic Indicators	Methodological Problems	Policy Recommendations	Applicability to Alberta
Kobza L. Scheurich A. the impact of telemedicine on outcomes of chronic wounds in the home care setting. Ostomy Wound Management 2000; 46(10):48-53. **USA**	In the baseline group, the number of home care visits averaged 60 visits per patient. The number of home care visits averaged 33 visits per patient with telemedicine intervention. Healing rate was defined as the percent of wounds healed by the time of discharge from the home health agency. With the exception of stage III pressure ulcers, healing rate for all wounds improved with the use of telemedicine intervention. Stage II pressure ulcers showed the greatest improvement with a 34% healing rate in the baseline group increasing to 83% with telemedicine. Stage IV pressure ulcers improved from 10% to 38%.	Exclusion criteria not mentioned. No discussion of analysis.	With the implementation of PPS, it is time to become more creative in delivering quality cost-effective care in the home setting. There is a lack of provider knowledge and understanding of telemedicine and its role in healthcare. This needs to be addressed through education and publication of relevant studies.	

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Kropf NP, Grigsby RK. Telemedicine for older adults. Home Health Care Services Quarterly 1999; 17(4):1-11. **USA**	Discusses challenges to the implementation of telemedicine. Next phase of telemedicine systems termed "third generation systems". Provides the family and patient with a virtual community to enhance the quality of life. Examples of services that are available are telebanking, teleworship, telexercise, and tele-stress management.	Descriptive study.	The major issues that need to be addressed are the intrusive quality of the system for patients, the ease with which older patients can use the technology, regulation of services and reimbursement. Another challenge is the certain regulatory and legal aspects that reflect changes in the systems. Liability is also a concern.	Yes. Broadens concept of services to home based clients.

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Author/ Article Title/ Year/ Country	Outcomes/ Socio-Economic Indicators	Methodological Problems	Policy Recommendations	Applicability to Alberta
Mair FS, Wilkinson M, Bonnar SA, Wootton R, Angus RM. The role of telecare in the management of exacerbation's of chronic obstructive pulmonary disease in the home. Journal of Telemedicine and Telecare 1999; 5(1):66-67. **UK**	It was possible; to complete the symptom charts, to obtain BORG scores, and to assess oxygen saturation, assess peak expiratory flow rates, and measure temperature and pulse via the video-phone, with patient cooperation.	Sample too small.	Remote management of COPD exacerbations has been demonstrated, and if proven safe and effective may reduce hospitalization and emergency visits.	Limited. Further research required.

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Author/ Article Title/ Year/ Country	Outcomes/ Socio-Economic Indicators	Methodological Problems	Policy Recommendations	Applicability to Alberta
McCullough, A. Viability and effectiveness of teletherapy for pre-school children with special needs. Int J Lang Commun Disord 2001; 36 (suppl):321-326. **IRELAND**	Both parents and therapists used the system extensively to share information regarding the therapy programme. Both parent and therapist felt there was substantial improvement in the children's communication skills. The results of this project suggest that telemedicine technology is a viable and effective treatment option for children with special needs.	Sample is extremely small. No discussion on how sample was generated.	It was possible to provide more frequent support without the need for domiciliary visits or specialist parent training sessions. The nature of the skills by the parents during the trial is a consideration for future research.	Yes. A novel application in what can be considered an 'undeserved' population. Possible application.

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Author/ Article Title/ Year/ Country	Outcomes/ Socio-Economic Indicators	Methodological Problems	Policy Recommendations	Applicability to Alberta
Mease A, Whitlock WL, Brown A, Moore K, Pavliscsak H, Dingbaum A, Lacefield D, Buker K, Xenakis S, Telemedicine improved diabetic management. Military Medicine 2000; 165(8):579-584. **USA**	Using a home telemedicine system to deliver care to patients with type II diabetes resulted in a 16% reduction in HbA levels, and a 4% mean weight reduction during a 3 month period of monitoring. Subject benefit was high.	Write up of results does not effectively answer the research question. Small sample size.	Information systems must be tailored to support collaborative care. The greatest need is for the development and proliferation of a functional application architecture bridging technology to current medical processes. Technology capabilities must be aligned with current medical processes and standards.	Yes. Demonstrates value of assisting diabetics to help themselves. [Note current SLICK program within Alberta].

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Author/ Article Title/ Year/ Country	Outcomes/ Socio-Economic Indicators	Methodological Problems	Policy Recommendations	Applicability to Alberta
Morlion B, Knoop C, Paiva M, Estenne M. Internet based home monitoring of pulmonary function after lung transplantation. Am J Respir Crit Care Med 2002; 165:694-697. **BELGIUM**	System used in the study proved to be technically feasible, and was well accepted by all patients but one. The average adherence to the monitoring was 55% for two measurement sessions a day and 84% for one measurement session a day. Overall agreement between home and hospital measurements was very satisfactory for both FEV1 and FEF25-75. The good agreement may be for two factors: the home computer provided the patient with a real-time visual feedback of the flow-volume curve, which presumably worked as an incentive to improve the quality of the expiratory maneuvers.	Small sample size. No inclusion/exclusion criteria used; unclear sampling strategy.	Considered limited. Feasibility of the application demonstrated, but low volume patient population.	None.

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Naef RW, Perry KG, Magann EF, McLaughling BN, Chauhan SP, Morrison JC. Home blood pressure monitoring for pregnant patients with hypertension. Journal of Perinatology 1998; 18(3):226-229. **USA**	The home values of mean arterial pressure and pulse were consistently less than those obtained in the clinic setting. The patients in the post-use questionnaire, found this machine to be very helpful in controlling hypertension through manipulation of their medication based on consistent trends in blood pressure.	Extremely small sample.	The cost effectiveness of automated monitoring versus standard clinical care of use of over-the-counter devices by patients has not been addressed. A much larger sample of women must be involved in studies.	Non yet. Still too much uncertainty.

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Author/ Article Title/ Year/ Country	Outcomes/ Socio-Economic Indicators	Methodological Problems	Policy Recommendations	Applicability to Alberta
Noel HC, Vogel DC. Resource costs and quality of life outcomes for homebound elderly using telemedicine integrated with nurse case management. Caremanagement 2000; October:22-31 USA	During telemonitoring, health care costs dropped and cognitive status, functional level and self-rated health status improved (occurred in both control and intervention groups). At the end of the study, resource use costs remained lower for both groups compared to baseline costs. Frequency of visits based on healthcare need-varied from 1 to 30 visits/month.	Size of the sample too small. Sample not representative . Intervention period too short. Telemonitoring supplemental to usual care. Elderly population: high risk & high cost.	Telemonitoring and coordination of healthcare services through nurse case management can be used in the delivery of high quality and less costly healthcare services for home-bound patients with complex and chronic co-morbidities and with high rates of recidivism. Since caregivers have little time to review data collected, must collect only the minimal data required and present in an easily accessed and understood manner.	Yes. Demonstrates potential for cost savings for CHF, Diabetes, COPD patients, but analysis limited.

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Author/ Article Title/ Year/ Country	Outcomes/ Socio-Economic Indicators	Methodological Problems	Policy Recommendations	Applicability to Alberta
Ostbye T, Hurlen P. The electronic house call: consequences of telemedicine consultations for physicians, patients and society. Arch Fam Med 1997; 6:266-271. **NORWAY**	Discusses different types of applications of telemedicine, such as within the disciplines of dermatology, pathology, cardiology, radiology, etc. Geographic distance will become less important as electronic accessibility grows. New health care provider roles will develop. As more user friendly databases and information systems become available, it may become possible for the general practitioner to handle more specialized problems. Independent patient groups can be set up. There are legal issues and quality assurance issues.	Descriptive	It is unrealistic and undesirable to substitute all office consultations and home visits with electronic house calls. Nonthreatening, peer-controlled audit groups may be the most effective professional evaluation, and telemedicine makes them easy to organize.	Yes. Useful discourse that relates to policy issues.

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Perry Britton B, Keehner Engelke M, Rains DB, Mahmud, K. Measuring costs and quality of telehomecare. Home Health Care Manage Prac 2000; 12(4):27-32 **USA**	Telehomecare represents how the use of technology can improve the care of patients while improving the bottom line home care agencies. Home care agencies that integrate Telehomecare into the services that they provide may find that it is valued by patients and contributes to the financial health of the agency.	Article is descriptive with presentations of case studies, but is not descriptive or detailed enough.	Home care agencies that integrate Telehomecare into the services they provide will find that it is valued by the patients and that it contributes to the financial health of the agency. A nurse who only provides telehomecare visits can typically make 15 visits/day, while a nurse providing traditional home care typically makes 6 visits/day.	Yes. Identified need for outcomes in 3 categories-patient outcomes, agency outcomes and system outcomes. Potential for increased access with current resources.

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Author/ Article Title/ Year/ Country	**Outcomes/ Socio-Economic Indicators**	**Methodological Problems**	**Policy Recommendations**	**Applicability to Alberta**
Phillips VL, Temkin A, Vesmarovich S, Burns R, Idleman L. Using telehealth interventions to prevent pressure ulcers in newly injured spinal cord injury patients post-discharge: results from a pilot study. International Journal of Technology Assessment in Health Care 1999; 15(4);749-766. USA	Those in the video group had the highest number of identified and/or reported pressure ulcers, while those in the telephone group reported slightly less. The number of reported ulcers in the standard group was midway between the other two. Annualized ER visits, hospitalizations, and health care provider visits were similar for the telephone group and video group, while the latter two were lower in the standard group. One-third of those in the telephone group were back at work, while nearly half in the video group were employed.	Possible sampling bias in the video group. Larger sample needed.	Telehealth may lead to better community reintegration and adjustment by promoting self-efficacy among SCI patients.	No. Conflicting results at this time. Further research required.

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Phillips VL, Vesmarovich S, Hauber R, Wiggers E, Egner A. Telehealth: reaching out to newly injured spinal cord patients. Public Health Reports 2001, 116:94-116. **USA**	The data suggests that telehealth interventions may produce benefits in terms of increased health-related quality of life that do not occur with standard care. Both intervention groups gained 18 days of quality-adjusted survival per year over the standard health care group.	Could have used a more powerful analysis to test results.	Identifies the key question: To what degree are telehealth interventions self-financing or cost saving? If the telehealth program costs, particularly those related to video based interventions, are more than offset by a reduction in future hospital costs, then the additional services provided post-discharge will pay for themselves overall.	Yes. Emphasizes the need to weigh potential utility and value of simple strategies such as telephone based patient care. Also provides a potential application for consideration.

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Piette JD, Weinberger M, Kraemer FB, McPhee SJ. Impact of automated calls with nurse follow-up on diabetes treatment outcomes in a department of veterans affairs health care system. Diabetes Care 2001; 24(2):202-208. **USA**	Overall, , 50% of intervention patients reported that they were very satisfied with the ATDM calls. In general, patients receiving the intervention were more favorably disposed to telephone care at follow-up than patients receiving usual care. In general, intervention patients at follow-up reported fewer symptoms of poor glycemic control than patients receiving usual care.	Study does not mention drop-out. Intervention group has a high proportion of white patients.	Various options are available for purchasing ATDM services. Each of these methods of purchasing ATDM capacity is viable, and the choice for a health care system will depend on factors such as the organization's ability to manage the system in-house and its preference for capital outlays versus ongoing predictable service charges.	Yes. Emphasizes the need to not discount or discard use of simple strategies such as preventative telephone based patient care.

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Rogers MAM, Small D, Buchan DA, Butch CA, Stewart CM, Krenzer BE, Husovsky HL. Home monitoring service improves mean arterial pressure in patients with essential hypertension. Annals of Internal Medicine 2001; 134(11):1024-1032. **USA**	A telecommunication service was efficacious in decreasing blood pressure in patients with established hypertension. Blood pressure decreased in patients who used the service, while hypertension worsened in patients receiving usual care. Mean diastolic, systolic, and arterial pressures decreased in patients who received home service. The data suggest that home service may be more effective in obese patients, although the interaction term was not statistically significant. The data suggest a considerable treatment effect in patients with angina, although a larger study is needed to confirm this. The main effect (difference in average mean arterial pressure for home service vs usual care) was statistically adjusted for demographic and lifestyle factors. When data were adjusted for age, sex and ethnicity, mean arterial pressure decreased by 3.0 mm Hg in those receiving home service and increased by 1.4 mm Hg in those receiving usual, a statistically significant difference.	Not a random sample. Ethnic category vague…what does white ethnicity mean?	Telecommunication may be a useful adjunct to antihypertensive therapy and warrants investigation in larger study samples.	Yes. Hypertension is a common illness. Potential application for consideration.

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Author/ Article Title/ Year/ Country	Outcomes/ Socio-Economic Indicators	Methodological Problems	Policy Recommendations	Applicability to Alberta
Rooney EM, Studenski SA, Roman LL. A model for nurse case managed home care using televideo. JAGS 1997; 45:1523-1528. **USA**				

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Ruggiero C, Sacile R, Giacomini M. Home telecare. Journal of Telemedicine and Telecare 1999; 5:11-17. **ITALY**	Reasons for introducing home telecare include: cost savings, improving the quality of measurements, obtaining a new kind of follow-up, and improving the quality of life. Home telecare, for the elderly especially, often allows hospitalization to be avoided. The requirements for technology support should be identified, and home care and hospital/medical services should be considered jointly, from several viewpoints. Home environment should be adapted for easy delivery of care and a tele-alarm system or a teleconsultation system should be available to cope with critical health situations.	Descriptive article.	The networks which provide home telecare services often need to be extensive, so telephone lines are usually the cheapest solution. A general requirement of home telecare systems therefore is that they are cheap. Worth considering if they comply with at least one of: a high percentage to be involved, so that unit costs decrease; the population should be spread over a region in which communication by road is difficult; there should be a need for continuous monitoring.	Yes. Useful discourse that relates to policy issues.

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Shah NB, Der E, Ruggerio C, Heidenreich PA, Massie BM. Prevention of hospitalizations for heart failure with an interactive home monitoring program. American Heart Journal 1998; 135:373-378. **USA**	Patient acceptance of the program was very high. 82% rated it as very useful or useful. The physicians treating the patients found the program helpful. Overall, the number of hospitalizations per patient-year follow-up after enrollment was .4 compared with .8 per patient during the equivalent period before enrollment.	Study involved men only. Sample was extremely limited due to all the criteria for inclusion.	Results indicate that hospitalizations can be substantially reduced by use of a program that includes patient education, attention to medication compliance, careful monitoring of clinical and fluid status, and facilitated access to healthcare providers. Potential target population to younger patients.	Yes. Hypertension is a common illness. Potential application for consideration.

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Srikanthan VS, Pell ACH, Prasad N, Tait GW, Rae AP, Hogg KJ, Dunn FG. Use of fax facility improves decision making regarding thrombolysis in acute myocardial infarction. Heart 1997; 78:198-200. **UK**	The consultant agreed with the SHO's decision in 98 of the 112 patients. The reasons for disagreement were based on ECG interpretation in 10 patients and clinical consideration in four. 17 of 112 patients benefited by the use of a fax machine and the discussion with the consultant.	Sample seems to be one of convenience. Does not explain how the SHO's were chosen to participant, or how the consultants were chosen.	They suggest that a fax facility be available in the coronary care unit and the consultant's home to be used when: 1. There is doubt that ECG criteria have been met. 2. There is a mismatch between the clinical assessment and the ECG. 3. There are other abnormalities such as previous MI or left ventricular hypertrophy making the ECG interpretation difficult.	None. Technology has moved on such that use of a fax in this manner is probably inappropriate.

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Author/ Article Title/ Year/ Country	Outcomes/ Socio-Economic Indicators	Methodological Problems	Policy Recommendations	Applicability to Alberta
Subirana Serrate R, Ferrer-Roca O, Gonzalez-Davila E. A cost minimization analysis of oncology home care versus hospital care. Journal of Telemedicine and Telecare 2001; 7:226-232. **SPAIN**	The time devoted by doctors was similar, but the time devoted by nurses were 4 times longer with the home care group. The total costs of home care were 64% of those for hospital care, although this difference was not significant. Cost reductions related to health-care efficiency could not be studied with objective measurements. The organizational aspects of telephone support are of great importance for the efficiency of management and patients' comfort, and can also provide clear cost savings. 27 home visits were avoided during the 4-month period of 24h support, and this represents 35.1 working hours and a total of Pta270,000 (Pta10,000 per visit) savings to the insurance company.	Article speaks of two groups, treatment and control…in reality, are three groups (two treatment groups and one control). Patients not matched for oncology pathologies. Sampling issues (non-randomized sample, sample too small)	Home care assistance can be carried out only by well trained, coordinated teams, capable of managing a small number of patients, in contrast with the uniform mass care provided in hospitals. More sophisticated telemedicine techniques, such as the use of mobile control units, may be unnecessary.	Yes. Questions utility of an oncology application and raises issue of breadth of application of home telehealth and need to identify those populations that could most benefit.

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Author/ Article Title/ Year/ Country	Outcomes/ Socio-Economic Indicators	Methodological Problems	Policy Recommendations	Applicability to Alberta
Tang P, Venables T. Smart homes and telecare for independent living. Journal of Telemedicine and Telecare 2000; 6:8-14. **UK**	The home is becoming an increasingly important location for care and cure. Telecare could represent an example of a better service. Telecare falls into two categories, advise and assistance. In terms of advice, telecare relies on the use of telephone links and call centres. In terms of assistance, carers are alerted when a problem is identified by the telecare system.	Review article	There are legal, ethical, technical, regulatory and financial considerations in the wide-scale introduction of telecare and smart homes. Health, social services and housing policy makers should consider establishing a telecare forum in which telecare and housing providers foster coordination between themselves.	Yes. Useful discourse that relates to potential technology development opportunity and policy issues related to "smart" homes.

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Tsang MW, Mok M, Kam G, Jung M, Tang A, Chan U, Chu CM, Li I, Chan J. Improvement in diabetes control with a monitoring system based on a hand-held, touch-screen electronic diary. Journal of Telemedicine and Telecare 2001; 7:47-50. **CHINA**	Significant difference in the duration of illness between the two groups. Majority of the patients (95%) felt that the system was easy to use. Most of them also agreed that the DMS was useful in evaluating their eating habits. 7 of 19 patients stated that they had technical problems. With the DMS, there was for the first time proper documentation of the patient's compliance with the meal plan.	Very small sample. Nothing mentioned on how the participants were recruited, or what criteria made them eligible or ineligible for the study. No explanation of the analysis was mentioned.	Provides a feasible model of telemedicine in diabetes care, but a larger study is warranted to examine cost-effectiveness.	Yes. Demonstrates value of a model that uses forthcoming wireless technology applications in a population that is of concern and risk for increasing morbidity. [Note current SLICK program within Alberta].

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Wasson J, Gaudette C, Whaley F et al. Substituting Clinician-initiated telephone calls for clinic visits. ACP Journal Club 1992; July/August:30. **USA**	Both groups were equally satisfied with their health care provider, quality of care and health care access. Telephone care costs were 28% less for two years. For those patients starting with fair or poor health, telephone care resulted in lower care charges, a possible reduction in mortality, and improved activity.	Need a more diverse sample (ie. Women, different age groups) and fewer exclusion criteria.	Physician initiated telephone calls substituted for some clinic visits can lower costs and health care usage without harming patient health.	Yes. Emphasizes the need to not discount or discard use of simple strategies such as preventative telephone based patient care.

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Whitten P. Mair F. Collins B. Home telenursing in Kansas: patients' perceptions of uses and benefits. Journal of Telemedicine and Telecare 1997; 3(1):67-69. **USA**	The technology was not an area of concern for them. They spoke about it in terms of the services they received. Spoke about telenursing in one of three ways: as a security tool, as a project that offered no benefits to them, and as a tool to address specific medical conditions. Telenurses were not viewed differently than other nurses.	Small sample size. Selection based on location, rather than health service.	Research projects which measure technical feasibility should be distinct from those which purport to provide a service.	Limited.

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Williams G, Doughty K, Bradley DA. Safety and risk issues in using telecare. Journal of Telemedicine and Telecare 2000; 6:249-262. **UK**	Discusses a number of implications of having home-based technology implemented.	Descriptive article.	Every telecare device, and especially those embedded in second-generation systems, will have to be designed with both reliability and safety in mind. Predictive systems are perhaps most valuable type of telecare because they can, in principle, provide a means of monitoring the status of the client and of highlighting areas before they become so bad. Suitable measures must be taken at the design stage to build in resilience to individual failures so that systems will failsafe and degrade gracefully.	Yes. Appropriate due diligence and risk management issues related to policy development.

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Wilson LS, Gill RW, Sharp IF, Joseph J, Heitmann SA, Dadd MJ, Kajan A, Collings AF, Gunaratnam M. Building the hospital without walls-a CSIRO home telecare initiative. Telemedicine Journal 2000;6(2):275-281. **AUSTRALIA**	The project is at an early stage of development, but it is clear that the technology being assembled has the capability of enhancing the care of patients subject to falls, as well as other categories patients requiring a level of care not normally available in their own homes. Some of the technology developed in this project would be suitable for monitoring cardiac patients recovering from major procedures, or subject to conditions such as congestive heart failure.	Descriptive study.	The potential for ongoing monitoring of patients has implications for development of 'smart' homes to permit independent living for some groups of patients (e.g. elderly, handicapped).	Yes. Potential area of technological development (remote wireless monitoring, plus data processing and presentation of complex continuous or discrete data).

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Wootton R, Loane M, Mair F, Allen A, Doolittle G, Begley M, McLernan A, Moutray M, Harrisson S. A joint US-UK study of home telenursing. Journal of Telemedicine and Telecare 1998; 4(1):83-85. **UK**	The proportion of visits which were deemed suitable for telemedicine in the US was conservatively assessed at 45%, while in the UK the proportion was considerably lower, less than 15%.	The UK patient sample was extremely small, only 36 patients. Hard to make proper comparisons based on the unequal samples.	The proportion of traditional home health visits that can be performed by home telehealth differs between countries.	Yes. Need to determine the proportion of home health visits that can be performed by home telehealth within Alberta.

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Wootton R, Loane M, Mair F, Moutray M, Harrisson S, Siivananthan S, Allen A, Doolittle G, McLernan A. The potential for telemedicine in home nursing. Journal of Telemedicine and Telecare 1998; 4:214-218. **UK**	A total of 1626 nursing visits involved "hands on" intervention, and this accounted for most of the visits not considered feasible by telemedicine. The proportion of visits assessed as suitable for telemedicine was 13.5%, while 69% were considered unsuitable. Pilot trials with the analogue phone were successful and suggest that despite the relatively low video quality, the technique may be useful in home telecare.	Retrospective study Does not specify the criteria used to judge what was suitable for telemedicine and what wasn't. Does not specify the purpose of the pilot study.	Need a clearer understanding of the proportion of traditional home healthcare visits that can be performed through home telehealth.	Yes. Indicates a low 14% of traditional homecare visits could be done by home telehealth, yet implies this is still a useful application for home telehealth.

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Zelickson BD, Homan L. Teledermatology in the nursing home. Arch Dermatol 1997; 133:171-174. **USA**	Correct diagnoses were made for 60 (67%) of the 90, 51 of 60, and 53 of patients given the history alone, image and both, respectively. All the patients or guardians with completed surveys felt they received good care through teledermatology. 4 of 5 would like to receive all their specialty medical care through telemedicine and 5 of 6 prefer teledermatology to traveling to their dermatologist's office.	Small sample Selection bias (first come first serve). Small return rate for survey.	Most, if not all, of the telemedicine systems that started in the 1970's were not able to remain financially viable. Many systems are costly to set up and maintain. It is the suggestion of the article that an asynchronous store-and-forward system is the most economical for teledermatology.	Yes. Potential area of application (teledermatology within home telehealth).

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APPENDIX H: CRITIQUE TELE-HOMECARE

Author/ Article Title/ Year/ Country	Outcomes/ Socio-Economic Indicators	Methodological Problems	Policy Recommendations	Applicability to Alberta
Zhang Y, Zhou JB, Dai B, Cui Z, Lin J, Ding C, Zhang P, Yu B, Ye L, Shen D, Zhu Z, Zhang J, Ye D, Zhou L. first trial of home ECG and blood pressure telemonitoring system in Macau. Telemedicine Journal 1997; 3(1):67-72. **CHINA**	All the physicians considered the system to be acceptable and helpful for the cardiac patients, especially for supporting patients discharged early from the hospital. With 15 minutes of training for both patients and physicians, users felt the system was easy to operate. The system appears reliable, with only one incident of down time in 3 months caused by a power failure.	Sampling problems. No mention of exclusion/inclusion criteria.	Sicker patients will generate more alarms and greater demand on the communication link. Further investigation is required to match the patient population with sufficient system capacity.	Limited.

Note: Abbreviations used in this document are described in Appendix D

APPENDIX I: CRITIQUE TELE-MENTAL HEALTH

Author / Article Title / Year / Country / Location	**Purpose / Objectives**	**Design**	**Analysis**	**Participants: age / gender / groups**	**Intervention / Duration**	**Follow-up: sample size; dropout**	**Outcomes / Socio-Economic Indicators**	**Methodological Problems**
Elford DR, White H, St John K, Maddigan B, Ghandi M, Bowering R. A prospective satisfaction study and cost analysis of a pilot child telepsychiatry service in Newfoundland. J Telemed Telecare 2001; 7(2):73-81. **Canada** Newfoundland	To evaluate user satisfaction with a videoconferencing system used for child psychiatry assessments and perform a cost analysis	Descriptive (VIII) Strength of Evidence (SoE): Poor Survey of parents and children for satisfaction. Self reported estimates of cost.		n=30 children requiring psychiatric consultation (aged 5-16 years), each accompanied by a parent	Videoconferencing – based consultation		The estimated total travel cost for the 30 patients was $12,849, an average of $428 per patient. The total cost of the telepsychiatry service for the three-month pilot was $12,575, or $419 per patient	

Note: Abbreviations used in this document are described in Appendix D

Author / Article Title / Year / Country / Location	Purpose / Objectives	Design	Analysis	Participants: age / gender / groups	Intervention / Duration	Follow-up: sample size; dropout	Outcomes / Socio-Economic Indicators	Methodological Problems
Hunkeler E M, Meresman J F, Hargreaves WA, et al. Efficacy of nurse telehealth care and peer support in augmenting treatment of depression in primary care. Archives of Family Medicine 2000; 9(8): 700-708. **USA** Kaiser Permanente, Northern California	To assess the efficacy of augmentations to antidepressant treatment in primary care.	RCT (II) SoE: Good Compares usual physician care, nurse telehealth care and nurse telehealth care plus peer support.		Patients with major depressive disorders . Of 302 patients, 41% randomized to usual physician care, 39% to nurse telehealth, 21% to nurse telehealth plus peer support.	Outcomes included reduction in depressive symptoms, improvement in functioning, satisfaction with care, medication adherence. 90% interviewed at 6 weeks, 85% at 6 months.		Compared with usual physician care, telehealth care improved depressive symptoms, mental functioning and treatment satisfaction. Medication adherence did not improve with nurse telehealth care. Adding peer support to telehealth did not improve the primary outcomes. Nurse telehealth improves clinical outcomes of antidepressant drug treatment.	Limited contact between patients and peers in third arm of study.

Note: Abbreviations used in this document are described in Appendix D

APPENDIX I: CRITIQUE TELE-MENTAL HEALTH

Author / Article Title / Year / Country / Location	Purpose / Objectives	Design	Analysis	Participants: age / gender / groups	Intervention / Duration	Follow-up: sample size; dropout	Outcomes / Socio-Economic Indicators	Methodological Problems
James LC, Folen RA, Earles J. Behavioral telehealth applications in the treatment of obese soldiers: A feasibility project and a report on preliminary findings. Military Psychology 2001; 13(3):177-186. **USA** Military bases, Hawaii	To study the efficacy of a telehealth – based weight loss program	Cohort study (VI) SoE: Fair		48 obese service members (aged 21-48 yrs)	3-wk, day-treatment, cognitive-behavioral weight loss program coupled with 12 mo of weekly follow-up aftercare; n=14 were provided follow-up via interactive video and an interactive Web page; n= 34 attended weekly follow-up at the hospital.		Significant weight loss for both groups. There were no significant differences in weight loss between patients who completed follow-up at the hospital and patients who participated in interactive video follow-up sessions	Authors note small sample size and lack of randomization.
Kates N, Crustolo AM, Nikolaou L, Craven MA, Farrar S. Providing psychiatric backup to family physicians by telephone. Can J Psychiatry 1997; 42(9):955-959. **Canada** Hamilton, ON	To examine whether links between psychiatric services and family physicians can be strengthened and additional support provided if a psychiatrist is available by phone	Descriptive - survey (VIII) SoE: Poor		Psychiatrist and18 family physicians in 5 practices	telephone advice from psychiatrist, as requested		Over the course of one year, 128 calls were received from the 5 practices. Fifty were considered urgent, while 78 involved more routine management or medication issues. After discussion 39 [78%] of the urgent problems were handled by the GP , avoiding referral to specialist services	Relies on physician opinion fpr comparison of options

Note: Abbreviations used in this document are described in Appendix D

APPENDIX I: CRITIQUE TELE-MENTAL HEALTH

Author / Article Title / Year / Country / Location	Purpose / Objectives	Design	Analysis	Participants: age / gender / groups	Intervention / Duration	Follow-up: sample size; dropout	Outcomes / Socio-Economic Indicators	Methodological Problems
Kummervold P. Social support in a wired world - Use of online mental health forums in Norway. Technology and Health Care 2001; 6th International conference; Medical aspects of telemedicine -- 2001 Jun : Uppsala, Sweden pp 59-65 **Norway** Tromso	To explore use of four major Norwegian mental health related online support groups	Descriptive - questionnaire (VIII) SoE: Poor		users of the support groups; 505 returned questionnaires , of whom 317 had used traditional mental health care services.	Use of on line advice, discussion		Of those who had also used conventional services, 62% perceived the on line forums as a supplement, 17% said they were both a supplement and a replacement and 4 % saw them exclusively as a replacement (remainder undecided). 53% reported no effect on use of conventional services, 6% reported reuced use and % increased use. 17% reported a qualitative change in use, increased knowledge and more active. Of n=408 who responded to the relevant questions in the survey, 75% found it easier to discuss personal problems in discussion forums than face to face.	Authors note possible bias from participants being self-selected

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APPENDIX I: CRITIQUE TELE-MENTAL HEALTH

Author / Article Title / Year / Country / Location	Purpose / Objectives	Design	Analysis	Participants: age / gender / groups	Intervention / Duration	Follow-up: sample size; dropout	Outcomes / Socio-Economic Indicators	Methodological Problems
Lynch DJ, Tamburrino MB, Nagel R. Telephone counseling for patients with minor depression: preliminary findings in a family practice setting. J Fam Pract 1997; 44(3):293-298. **USA** Toledo, Family practice	To develop and apply telephone treatment protocol for patients with minor depression and to assess impact on patient functioning, well being	RCT (III) SoE: Good-Fair N<30	Evaluation through the Medical Outcomes Study Depression Screening Scale and the Diagnostic Interview Schedule to identify those with subthreshold or minor depression. Status of participants assessed by survey with standard instruments	Patients in a family practice residency practice. N=63 identified, n=29 agreed to participate, 15 randomised to treatment group, 14 controls, 2 males in each group. Initial scores on the Hamilton Depression Rating Scale were equivalent for the groups and were in the mildly depressed range.	Six problem-solving therapy sessions were conducted over the telephone by graduate student therapists supervised by a psychiatrist. Use of a problem solving therapy developed by Nezu et al.	At week 7 after commencement of intervention, complete follow up data for 11 treatment, 13 comparison, while 4 and 4 completed only the Hamilton Scale;	Treatment group subjects had significantly lower post-intervention scores on the Hamilton Depression Rating Scale compared with their pre-intervention scores (P < .05). Scores did not differ significantly over time in the comparison group. Post-intervention, treatment group subjects also had lower Beck Depression Inventory scores than did the comparison group (P < .02), as well as more positive scores for social health (P < .002), mental health (P < .05), and self-esteem (P < .05) on the Duke Health Profile.	Small sample size, and incomplete follow up for some participants. The Beck and Duke instrments were not administered to any paerticipants prior to the intervention. Care given to the comparison group is not described.

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APPENDIX I: CRITIQUE TELE-MENTAL HEALTH

Author / Article Title / Year / Country / Location	Purpose / Objectives	Design	Analysis	Participants: age / gender / groups	Intervention / Duration	Follow-up: sample size; dropout	Outcomes / Socio-Economic Indicators	Methodological Problems
Mahoney DM, Tarlow B, Jones RN, Tennstedt S, Kasten L. Factors affecting the use of a telephone-based intervention for caregivers of people with Alzheimer's disease. J Telemed Telecare 2001; 7(3):139-148. **USA** Boston 60 sites in 3 States, linked to system at Boston Medical Center	To investigate the usefulness of a computer-mediated interactive voice response (IVR) system integrated with voicemail to help family caregivers manage disruptive behaviours in people with Alzheimer's disease.	RCT (III) SoE: Good-Fair Compares groups that did or did not have access to the VR system. However, paper reports only on the intervention arm, considering usage of system and reaction to it. Quantitative measures of use of the system and 'qualitative debriefing interviews'.		49 caregivers in intervention group and 51 in control group	Using a telephone, caregivers were linked to the four components of the IVR system: monitoring and counselling, an in-home support group, 'ask the expert', and a respite conversation	Length of study was 18 months. 48 in intervention group and 49 in control available for interview after 12 months. Usage data lost on 7 of original intervention group, presented for n=42	Total system usage 55 min per user (SD 78, range 1-318). Half the participants used the system for at least 22 min, and 25% for at least 70 min. Participants made between one and 45 calls over the study period, averaging 11 calls. N=20 used the system regularly for two or more months. They ' were significantly older, more highly educated and reported a greater sense of management of the situation than 'non-adopters'. The IVR approach appealed to a subset of users. However, the overall preference was for human interaction	Minimal details provided on the qualitative interviews.

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Mielonen ML, Ohinmaa A, Moring J, Isohanni M. Psychiatric inpatient care planning via telemedicine. J Telemed Telecare 2000; 6(3):152-157. **Finland** University H and two primary health care centres	To assess costs of psychiatric inpatient planning in comparison to face to face consultations.	Case series and cost study	Estimated costs based on exam and travel time, local costs.	14 mental health patients who had telepsychiatry; costs compared with those for 20 consultations at the hospital.	telepsychiatry		At a caseload of 20 patients a year, cost of telepsychiatry would be FM 2,510 per patient compared to FM 4,750 per patient for conventional consultation. If only one person travelled for a conventional meeting, costs were similar. At 50 care consultations per year, a remote municipality would save about FM117,000 Generally high satisfaction with the teleconsultation approach (patients, health care personnel, relatives). Results show that videoconferencing produces almost as a good an outcome as conventional meetings.	Small sample size. Cost savings magnitude highly dependent on practice adopted for number of staff in conventional visits.
Rohland BM. Telepsychiatry in the heartland: if we build it, will they come? Community Ment Health J 2001; 37(5):449-459. **USA** major centre and two rural sites	To compare service satisfaction and functional status in persons using telemedicine with those receiving face-to-face services at two rural sites	Cross over, each rural site used telemedicine for 1 year	Global Assessment function (GAF) scores	n = 12 (range of psychiatric conditions);	videoconsultation	Over two years for all patients	Changes in GAF scores between first and last visits by telemedicine in the two groups were 8.1 and 1.2, compared to – 6.9 and 3.8 for face to face consults. Combined results were 5.8 for telemedicine and - 3 for face to face.	Small numbers. Limited detail provided

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Author / Article Title / Year / Country / Location	Purpose / Objectives	Design	Analysis	Participants: age / gender / groups	Intervention / Duration	Follow-up: sample size; dropout	Outcomes / Socio-Economic Indicators	Methodological Problems
Schopp L, Johnstone B, Merrell D. Telehealth and neuropsychological assessment: New opportunities for psychologists. Professional Psychology - Research & Practice 2000; 31(2):179-183. **USA** Columbia, Missouri	To compare client and psychologist ratings of neuropsychological assessment services	Part 1: Non-randomized controlled prospective trial (IV) SoE: Good-Fair		N=98 outpatients with cognitive disabilities, n=49 interviewed by video, remainder in person	Video interviews		Telehealth clients were more likely to want to repeat their experience, but psychologist satisfaction was lower for telehealth sessions. Telehealth costs were significantly lower than in-person costs (per – session costs $67.7 for telemedicine, $83.6 for patient travel for interview, $238.77 for outreach)	Randomisation to groups is mentioned but the precise matching of patients by diagnosis between the groups makes this seem unlikely

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Author / Article Title / Year / Country / Location	Purpose / Objectives	Design	Analysis	Participants: age / gender / groups	Intervention / Duration	Follow-up: sample size; dropout	Outcomes / Socio-Economic Indicators	Methodological Problems
Simon GE, VonKorff M, Rutter C, Wagner E. Randomised trial of monitoring, feedback, and management of care by telephone to improve treatment of depression in primary care. BMJ. 2000 Feb 26;320:550-4. **USA** Washington State, 5 primary care clinics	To assess whether feedback to physicians or feedback plus telephone care by case managers improve outcomes in patients treated for depression.	RCT (II) SoE: Good {allocation concealed}, blinded (outcome assessors), follow-up at 3 and 6 months.	Data on follow-up visits were obtained from computerized records. Depression was assessed by telephone interview, using the 20-item depression scale from the Hopkins symptom checklist and the structured clinical interview for the current DSM-IV depression module. Treatment cost was calculated from the 1997 Medicare fee schedule for visits and actual costs for all other services. Analysis was by intention to treat.	Patients starting anti depressant treatment. Of 872 eligible patients, 613 (mean age 47 y, 72% women) participated.	n= 221 allocated to feedback only (detailed report that included data on antidepressant dosage, repeat prescriptions, number of follow-up visits, and limited treatment recommendations based on a computerized algorithm). N= 196 had feedback plus care management, [5-minute introductory telephone call from the case manager and two 10- to 15-minute telephone assessments at 8 and 16 weeks. Physicians also received feedback reports from care managers after each assessment.] n=196 had usual care only.	97% at 3 months and 94% at 6 months.	At 3 months, the intervention groups did not differ from the usual-care group for number of primary care, follow-up, or total follow-up visits. At 6 months, patients in the feedback-plus-care-management group had lower depression scores, a higher probability of showing a 50% decrease in depression scores on the symptom checklist (OR 2.22, 95% CI 1.31 to 3.75), and a lower probability of persistent major depression (OR 0.45, CI 0.24 to 0.86); the feedback-only group did not differ from the usual-care group. For TH group mean depression score declined from 1.66 to 0.83 at 6 mo.	Authors note uncertainty as to cause of benefits. Also that results might not be generalisable to different groups of primary care doctors and that study applied only to those with new antidepressant medications.

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Author / Article Title / Year / Country / Location	**Purpose / Objectives**	**Design**	**Analysis**	**Participants: age / gender / groups**	**Intervention / Duration**	**Follow-up: sample size; dropout**	**Outcomes / Socio-Economic Indicators**	**Methodological Problems**
Simpson J, Doze S, Urness D, Hailey D, Jacobs P. Telepsychiatry as a routine service--the perspective of the patient. J Telemed Telecare 2001; 7(3):155-160. Idem. Evaluation of a Routine telepyschiatry service. J Telemed Telecare 2001; 7(2):90-98. **Canada** Alberta, mental health facilities/clinics in regional hospitals	To obtain data on costs associated with operation of a routine telepsychiatry service	Cost study as part of an observational study.	Breakeven analysis of telepsychiatry versus services provided by a psychiatrist travelling to smaller centres. Estimates of cost to patients who would have to travel to a major centre for consultation.	Study covered 546 tele-consultations (379 patients requiring psychiatric consultation) over a period of 2 years.	Psychiatric consultation using video link		Breakeven point was 348 consultations/y ($630/ consultation). With use of video -conferencing for administration, breakeven point was 224 consultations/y (actual use of the service 273 consultations/y). Costs to patients who would have to travel to a major centre were $210 per consultation.	Limited details on costs to patients, estimate of impact is only indicative.
Strawn BD, Hester S, Brown WS. Telecare: a social support intervention for family caregivers of dementia victims. Clinical Gerontologist 1998; 18(3):66-69. **USA** San Diego	To examine the utility of a telephone intervention called Telecare to provide support and assistance to caregivers of individuals with dementia	Non-controlled Clinical Series (VIII) SoE: Fair-Poor within-subjects baseline treatment over 12 weeks		14 caregivers	Structured telephone intervention from a "caring caller" to provide advice and support		"ANOVA of he Globa Severity Index of the Brief Symptom Inventory indicated a significant decline in symptomatology [eg stress] over the five assessments (F(4,52) = 4.05, p<0,01. Decrease in perceived burden was also significant over time (F(4,52) =6.75, p<0.002) "	few details in a brief publication; authors suggest Telecare is time and cost efficient but there are no data to support

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Author / Article Title / Year / Country / Location	**Purpose / Objectives**	**Design**	**Analysis**	**Participants: age / gender / groups**	**Intervention / Duration**	**Follow-up: sample size; dropout**	**Outcomes / Socio-Economic Indicators**	**Methodological Problems**
Swinson RP, Fergus KD, Cox BJ, Wickwire K. Efficacy of telephone-administered behavioral therapy for panic disorder with agoraphobia. Behaviour Research & Therapy 1995; 33(4):465-469. **Canada** Toronto, anxiety clinic	To determine the efficacy of a structured exposure-based behavior therapy program delivered by telephone to agoraphobic individuals who were isolated from specialized treatment centres	RCT (III) SoE: Good-Fair N<30		N=46 from rural Ontario with diagnosis of panic disorder with agorophobia. N=42 (37 women) completed program, N=20 active treatment, n=22 wait list control	Eight therapy sessions conducted by telephone. Patients originally in the wait-list group [control] then received the same type of therapy.	Four of 46 did not complete program. Follow up after treatment for 6 months, n=35	There were significant treatment x time interaction effects on several outcome variables.The control group also significantly improved when given the intervention. All treatment gains were maintained at three-month and six-month follow-up	Small numbers and some drop outs
Tang WK, Chiu H, Woo J, Hjelm M, Hui E. Telepsychiatry in psychogeriatric service: a pilot study. Int J Geriatric Psychiatry 2001;16: 88-93 **China** Hong Kong	To examine the feasibility, acceptability, costs , benefits and limitations of telepsychiatry	Case series with cost estimates		n=45 residents of a care and attention home	149 psychiatric assessments by videoconferencing over 11 months		Cost of teleconferencing was $HK 91.81 per consultation, compared with $HK 105.78 for an in person consultation where the psychiatrist travelled to the home.	

Note: Abbreviations used in this document are described in Appendix D

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Author / Article Title / Year / Country / Location	**Purpose / Objectives**	**Design**	**Analysis**	**Participants: age / gender / groups**	**Intervention / Duration**	**Follow-up: sample size; dropout**	**Outcomes / Socio-Economic Indicators**	**Methodological Problems**
Trott P, Blignault I. Cost evaluation of a telepsychiatry service in northern Queensland. J Telemed Telecare 1998; 4 Suppl 1:66-68. **Australia** regional H in Townsville, and rural outreach service at MT Isa	To compare costs associated with delivering a mental health service by telepsychiatry and by conventional methods.	Descriptive (VIII) SoE: Poor	Cost analysis. Estimates of costs obtained for the telemedicine service (based on caseload after 6 months of operation) and for conventional consultations.	50 cases per month seen by telepsychiatry	Telepsychiatry		Savings to the health authority were estimated to be $85,380 in the first year and $112,790 in subsequent years, not allowing for maintenance and equipment upgrading. An estimated 40 % reduction in patient transfers due to telemedicine. Considerable savings from reduced travel by patients and health-care workers.	Authors note that costs associated with education and other non-clinical activities were not included.

Note: Abbreviations used in this document are described in Appendix D

Policy Recommendations	Applicability to Alberta	Comments
	Data are not applicable	Most of the article deals with the satisfaction survey, which indicated strong support for the technology – not considered here.

Note: Abbreviations used in this document are described in Appendix D

APPENDIX I: CRITIQUE TELE-MENTAL HEALTH

Policy Recommendations	**Applicability to Alberta**	**Comments**
Strong indication of efficacy of nurse telehealth, using approach that could be implemented within busy primary health care settings. Findings 'received with great interest' by clinical leaders in Kaiser Permanente Health Plan and in other health maintenance organizations		Authors suggest it would be worthwhile to further explore value of peer support when it is more clearly structured. They also conclude that their findings need to be replicated in other circumstances to judge how confidently broad adoption of nurse telehealth in this application can be recommended.

Note: Abbreviations used in this document are described in Appendix D

APPENDIX I: CRITIQUE TELE-MENTAL HEALTH

Policy Recommendations	**Applicability to Alberta**	**Comments**
Feasibility study indicates promising approach to behavioural health interventions	Applicable in principle	
Providing telephone backup to family physicians is a time-efficient and effective method of supporting family physicians and reducing utilization of mental health services. It is applicable to psychiatrists working in any clinical setting	Applicable	

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APPENDIX I: CRITIQUE TELE-MENTAL HEALTH

Policy Recommendations	**Applicability to Alberta**	**Comments**
Suggest need for public authoritiesto take appropriate account of Internet – based approaches	Potential application	

Note: Abbreviations used in this document are described in Appendix D

Policy Recommendations	**Applicability to Alberta**	**Comments**
Brief, telephone-based treatment for minor depression in family practice settings may be an efficient and effective method to decrease symptoms of depression and improve functioning. Nurses in these settings with appropriate training and supervision may also be able to provide this treatment	Study provides an indication of a possible approach but does not seem immediately applicable to Alberta. The conclusions seem speculative. As noted by authors, further validation would be needed. Also, the length of follow up is very limited and applicability of such an approach to routine practice in Alberta is uncertain.	

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APPENDIX I: CRITIQUE TELE-MENTAL HEALTH

Policy Recommendations	Applicability to Alberta	Comments
"IVR-mediated programme seems most suited to screening and monitoring functions for a short period, perhaps 6 months."	Not applicable; effectiveness of the approach not established, various technical difficulties, human approach preferred.	Main message from this study for the SOS is the need for appropriate and reliable technology for users; high proportion of caretakers did not like this technology.

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APPENDIX I: CRITIQUE TELE-MENTAL HEALTH

Policy Recommendations	Applicability to Alberta	Comments
Cost advantages of teleconsultations at moderate workloads. Satisfaction with content and interaction in teleconsultation. Implication that approach should be adopted.	Cost data not directly applicable; approach and implications applicable and consistent with Alberta assessment.	Measurement of satisfaction with the service also covered in the paper but not considered here
"telepsychiatry appears to offer an acceptable and adequate alternative mode of service delivery to persons who live in rural areas"	principle applicable [and has been applied]; little in this study of immediate relevance	More emphasis in this paper on satisfaction scores for patients [overall less satisfied with telemedicine]

Note: Abbreviations used in this document are described in Appendix D

APPENDIX I: CRITIQUE TELE-MENTAL HEALTH

Policy Recommendations	Applicability to Alberta	Comments
Telehealth offers useful option for suc services though "concerns about ethical issues, billing, and licensure must be addressed to help practitioners capitalize on new telehealth opportunities. "	General approach would be applicable	

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APPENDIX I: CRITIQUE TELE-MENTAL HEALTH

Policy Recommendations	Applicability to Alberta	Comments
'..results support implementation of organised monitoring and care management to improve management of depression.. However, such programmes only one component of population-based approach to treatment of depression.	Approach seems potentially useful; would need to validate under local practice conditions, review costs in Alberta setting	A successful POT intervention; organised follow up of patients seen as key.

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Policy Recommendations	Applicability to Alberta	Comments
Indication that costs of the telepsychiatry service are acceptable, and below breakeven point when use of administrative videoconferencing is considered. Also indications of savings to patients.	Alberta study, AMHB. Results informed decisions to expand the telemental service on a province-wide basis.	
suggesting that this is an effective means of enhancing well being of carers of persons with dementia	seems applicable	

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APPENDIX I: CRITIQUE TELE-MENTAL HEALTH

Policy Recommendations	**Applicability to Alberta**	**Comments**
Telephone behavior therapy appears to be efficacious treatment for agoraphobics living in remote regions where specialized anxiety disorder services are not readily available.	Applicable	
		Paper also gives details of satisfaction surveys of patient and staff, not considered here.

Note. Abbreviations used in this document are described in Appendix D

APPENDIX I: CRITIQUE TELE-MENTAL HEALTH

Policy Recommendations	Applicability to Alberta	Comments
Strong indication for continued support of the telemedicine	Consistent with experience and assessment in Alberta	

Note: Abbreviations used in this document are described in Appendix D

APPENDIX J: CRITIQUE TELERADIOLOGY

Author/ Article Title/ Year/ Country/ Location	Purpose/ Objectives	Design	Analysis	Participants: age/ gender/ groups	Intervention/ Duration	Follow-up: sample size; dropout	Outcomes/ Socio-Economic Indicators	Methodological Problems
Bailes JE, Poole CC, Hutchison W, Maroon JC, Fukushima T. Utilization and cost savings of a wide-area computer network for neurosurgical consultation. Telemed J 1997; 3(2):135-139. **USA** 20 community hospitals, western Pennsylvania	To determine potential cost savings of a wide-area teleradiology network for delivery of specialty care in neurologic surgery.	Clinical series, plus cost estimates.	Prospective review of cases before and after implementation of telemedicine with regard to disposition of the patient, mode of transportation and potential cost savings.	100 consecutive patients, with cases including neurologic emergencies and neurosurgical opinions.	Teleradiology with video consultation.		Estimated savings based on avoided tertiary hospital care (based on average length of stay) and on avoided air transportation were $ 502,638 for the 100-patient series. Of 100 patients, 33 did not require transportation as a direct result of remote diagnosis.	Authors note that savings to patients and families were not studied, but are potentially significant.
Bergmo TS. An economic analysis of teleradiology versus a visiting radiologist service. J Telemed Telecare 1996; 2(3):136-142. **Norway** University H in Tromsø, providing TR service to a military H 160 km away	To establish whether teleradiology is more or less expensive than a visiting radiologist service.	Economic analysis.	A public sector cost comparison of the change in resource use when providing a teleradiology service. Including the fixed and variable costs and travelling costs. Sensitivity analysis (4 and 6 years) and discounting.		The average workload used for the calculations was 25 patients/ day, or 6000 patients (8000 examinations) /year.		For teleradiology to be cheaper, the workload had to exceed 1576 patients per year. Assuming a shorter equipment lifetime, 4 rather than 6 yrs., increased the threshold value to 2320 patients per year.	

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APPENDIX J: CRITIQUE TELERADIOLOGY

Author/ Article Title/ Year/ Country/ Location	Purpose/ Objectives	Design	Analysis	Participants: age/ gender/ groups	Intervention/ Duration	Follow-up: sample size; dropout	Outcomes/ Socio-Economic Indicators	Methodological Problems
Boulanger B, Kearney P, Ochoa J, Tsuei B, Sands F. Telemedicine: a solution to the followup of rural trauma patients? J Am Coll Surg 2001; 192(4):447-452. **USA** Kentucky	To test the hypothesis that telemedicine-based followup of trauma patients discharged to remote areas is feasible and is associated with high patient and physician satisfaction.	Survey and observational study		22 trauma patients	routine followup appointment(s) at the TeleTrauma Clinic. Patients were examined and interviewed with the assistance of a nurse, an electronic stethoscope, and a close-up imaging instrument. Radiographs performed at the telemedicine site were viewed.		Return travel distance to the teletrauma clinic 44.7 miles vs 141.6 miles to major centre; corresponding travel times 79.5 min vs 174.5 min	

Note: Abbreviations used in this document are described in Appendix D

APPENDIX J: CRITIQUE TELERADIOLOGY

Author/ Article Title/ Year/ Country/ Location	**Purpose/ Objectives**	**Design**	**Analysis**	**Participants: age/ gender/ groups**	**Intervention/ Duration**	**Follow-up: sample size; dropout**	**Outcomes/ Socio-Economic Indicators**	**Methodological Problems**
Bracale M, Cesarelli M, Bifulco P. Telemedicine services for two islands in the Bay of Naples. J Telemed Telecare 2002; 8(1):5-10. **Italy** mainland hospitals and islands in the Bay of Naples.	to describe preliminary use of a teleconsultation network	Descriptive overview of initial experience	Cost consequences matrix is given but has little meaning given the limited data.	patients undergoing 46 telemedicine consultations per year from Procida (60% radiology, 30% cardiology, 10% other), and 28 telemedicine consultations per year from Ischia (80% radiology, 10% cardiology, 10% other)	Videoconference with mainland hospitals		The total fixed cost of the telemedicine system between the two islands and the two mainland hospitals was approximately Euro 48,000 per year. The total variable costs of the telemedicine service at the observed workload were about Euro 750 per year. The total savings due to telemedicine were approximately Euro 40,000 per year.	Estimates of cost savings are indicative only and make a number of assumptions, including availability of a radiologist for a small caseload in the absence of teleradiology and a figure for the costs of transport that is not supported by data.

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APPENDIX J: CRITIQUE TELERADIOLOGY

Author/ Article Title/ Year/ Country/ Location	Purpose/ Objectives	Design	Analysis	Participants: age/ gender/ groups	Intervention/ Duration	Follow-up: sample size; dropout	Outcomes/ Socio-Economic Indicators	Methodological Problems
Brumage MR, Chinn S, Cho K. Teleradiology in a military training area. J Telemed Telecare 2001; 7(6):348-352. **USA** Hawaii		Obsevational - description of activities during military training exercise		7 injured soldiers in period when teleradioology not available, and 32 when it was in place.	Teleradilogy link with major centre 400km away; comparison was emergency travel to civilian hospital 55km away.		29 evacuations were avoided through telradiology, which would have cost $36,569 in total. The expected savings during one year of training were $176,540. The cost of teleradiology during the first year, including the cost of the equipment, was $167,203. Projected 385% return in investment over 5 years	

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Chan FY, Soong B, Watson D, Whitehall J. Realtime fetal ultrasound by telemedicine in Queensland. A successful venture? *J Telemed Telecare* 2001; 7 Suppl 2:7-11 Chan FY, Soong B, Lessing K, Watson D, Cincotta R, Baker S et al. Clinical value of real-time tertiary fetal ultrasound consultation by telemedicine: preliminary evaluation. *Telemed J* 2000; 6(2):237-242. **Australia** Brisbane and Townsville	Evaluation of a realtime fetal tele-ultrasound consultation service	Observational study with cost estimates		71 pregnant women, 90% of the babies had been delivered.	Diagnostic ultrasound for patient at Townsville, remote interpreatation at Brisbane		The referring clinicians would have physically referred 24 of the 71 patients to Brisbane in the absence of telemedicine. A crude cost-benefit calculation suggests that the tele-ultrasound service resulted in a net saving of A$6340, and at the same time enabled almost four times the number of consultations to be carried out	Analysis relies on physician opinion. Cost estimates are only indicative, authors note absence of set up and equipment costs, and costs of clinicians.

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Davis MC. Teleradiology in rural imaging centres. J Telemed Telecare 1997; 3(3):146-153. **USA** Commercial MRI service providing services to 2 communities in Maryland	To study the feasibility of full-time primary magnetic resonance imaging (MRI) interpretation (using a central diagnostic workstation) of examinations generated at several distant sites.	Economic analysis [cost analysis including direct and indirect costs.]	Analysis used Three scenarios: High-field MRI unit with traditional film storage and on-site image interpretation; Mid-field MRI unit with film-based storage and a courier service for off-site interpretation; Mid-field MRI unit with filmless digital operation and remote image interpretation by teleradiology.	patients undergoing MRI examination	In a two-year study period, 8083 teleradiology examinations were performed.		At the expected case-load of 2,000 per year, a mid-field MRI unit was predicted to cost $470 per case using teleradiology and $544 per case using film and courier service	Notional values for some cost items, taken from another publication. Actual costs of operation said to be similar to those projected in the economic analysis, but details are not given

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Dawson A, Cohen D, Candelier C, Jones G, Sanders J, Thompson A et al. Domiciliary midwifery support in high-risk pregnancy incorporating telephonic fetal heart rate monitoring: a health technology randomized assessment. J Telemed Telecare 1999; 5(4):220-230 **UK** South Wales	Evaluate approaches to antenatal care of women with high risk pregnancies	RCT and cost study.		81 women with high risk pregnancies, 43 domiciliary care, 38 conventional care, ages 25.7 v 27.2 years.	Compared conventional care – frequent checks at hospital clinics including fetal monitoring (heart rate, movements, uterine contractions) – with domiciliary care including more frequent visits by midwives and fetal telemonitoring, 59.6 d for intevention group, 65.1 d for controls	All women followed until term.	Economic: Domiciliary care increased costs per woman by £21 for midwife time and travel, £18 for telemonitoring. Offset by savings of 45 in clinic costs, £184 for hospital inpatient days and £34 in lost productivity to the women and their partners. Clinical: Neonatal outcomes were similar for the two groups. Women in both groups had similar levels of anxiety and depression.	The authors noted that availability of home telemonitoring influenced management of the conventional care group. Unable to obtain marginal costs for clinic visits

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Diekmann F, Grebe S, Bick U, Winzer KJ, Paepke S, Hamm B. Intraoperative digital radiography for diagnosis of nonpalpable breast lesions. Rofo Fortschr Geb Rontgenstr Neuen Bildgeb Verfahr 2000; 172(12):969-971. **Germany** Berlin	To demonstrate the efficacy of an intraoperative mammography system	prospective comparison with use of conventional mammography		74 women undergoing surgery for breast cancer, 38 with interoperative radiography	Intraoperative radiography using digital mammography system, remote interpretation by raiologist		The time interval from removal of the specimen to reporting of the results was reduced from about 23 min to about 13 min.	paper mentions that the new technique resulted in considerable time savings for the surgeon and the radiologist and that the duration of surgery was shorter, but details are not presented.

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Eljamel MS, Nixon T. The use of a computer-based image link system to assist inter-hospital referrals. British Journal of Neurosurgery. 1992;6:559-562. **UK** Neurosurgical unit in Liverpool H, linked to peripheral CT sites in N Wales, Cheshire, Isle of Man.	To assess the value and reliability of image transmission on management of neurosurgical emergencies.	cohort study Comparison of patient management with and without transmission of CT-scans to the neurosurgical unit		n=147, scanned in the referring hospital with images sent to the neurosurgical centre. The outcomes of 51 patients who were than transferred as en emergency (Group 1) compared with those for 52 patients who were transferred without an image being sent	Patients with a history suggesting an intracranial hematoma and fit for transport transferred without delay, others scanned in the referring hospital and images transferred to the neurosurgical centre. These patients compared to those transferred without prior transmission of CT.		94.1% of Group 1 had emergency surgery compared with 23.1% in Group 2. None of Group 1 and 32.7% of group 2 were returned to the referring hospital within 24 hours. Image transfer together with clinical history significantly reduced potentially hazardous inter-hospital transfer of patients. There were savings in transfer costs of patients.	Brief details of travel avoided and notional associated costs, but no true cost analysis.

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Fery-Lemonnier E, Brayda E, Charpentier E, et al. [Inter hospital transmission of radiological images for handling neurosurgical emergencies. Results of the evaluation]. [French] Paris: Comite d'Evaluation et de Diffusion des Innovations Technologiques (CEDIT), 1996. **France** 7 neurosurgical centers and 180 district Hs in Paris	To determine the effect and cost-effectiveness of teleneuroradiology on patient transfer rates from a district hospital to a neurosurgical center.	cohort	Three months of observation before and after the implementation of teleneuroradiology. Economic analysis of the costs of implementation of the system and the costs of patient transfer with and without teleneuroradiology	Patients with requests for transfer to neurosurgical unit [over 10 000 requests for patient transfer per year.]	teleradiology, CT exam data		With the observed usage of image transfer, cost of avoided unnecessary patient transfer was FF 10 800. Even with a 70% usage of the system, cost of avoided unnecessary patient transfer would be FF 3 800. Sensitivity analysis. Images were transferred in only 25 % of cases. If patients were referred with teleradiologic images, 200 unnecessary transfers would be avoided per year.	

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Fisk NM, Sepulveda W, Drysdale K, et al. Fetal telemedicine: Six month pilot of real-time ultrasound and video consultation between the Isle of Wight and London. British Journal of Obstetrics and Gynaecology 103[11], 1092-1095. 1996. **UK** Isle of Wight and London	Initial evaluation of remote fetal consultation service	prospective audit		29 women with suspected fetal abnormality	teleultrasound and video transmission		Referral in person required for 4 women, compared to 13 who would have been referred in the absence of the service.	estimate is based on referring practitioner opinion prior to consultation

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Franken EA, Jr., Whitten P, Smith WL. Teleradiology services for a rural hospital: a case study. J Telemed Telecare 1996; 2(3):155-160. **USA** Arkansas	To investigate the perceived quality of teleradiology services offered at a rural hospital in comparison with radiology provided by three other methods: 'circuit riding', an on-site radiologist, and a hybrid arrangement.	case study, interviews of administrators, technologists and physicians at the rural hospital, structured survey of all staff physicians.	analysed both qualitatively and quantitatively.		teleradiology services had been provided for about 4 months		Both interviews and the survey indicated that teleradiology was perceived to be as accurate as on-site film interpretation. All other aspects of the service--efficiency, reports, communications and the overall contribution to patient care--were judged to be poorer than on-site radiology	

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Goh KYC, Lam CK, Poon WS. The impact of teleradiology on the inter-hospital transfer of neurosurgical patients. British Journal of Neurosurgery 1997; 11(1):52-56. **China** Teaching H and regional neurosurgery center, Hong Kong.	To examine the role of teleradiology in the management of inter-hospital transfer of neurosurgical patients.	Comparison of events before and after implementation of telemedicine. - Prospective collection of data from events during the inter-hospital transfer of patients from a district general hospital to a tertiary neurosurgical center.		50 referrals of neurosurgical patients made without teleradiology were compared with 66 referrals after teleradiology installation.	teleradiology		For patients referred with teleradiologic images, unnecessary transfers were reduced (21%), more therapeutic measures before transfer were implemented (27% vs 20%), adverse events during transfer were significantly reduced (8% vs 32%, p=0.002), and transfer time was shortened (72 min vs 80 min).	Small sample size; trends to lower mortality and increased favorable outcomes in telemedicine group, but not statistically significant.

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Halvorsen PA, Kristiansen IS. Radiology services for remote communities: cost minimisation study of telemedicine. BMJ 1996; 312(7042):1333-1336. **Norway** Primary health care clinic in a remote community linked to general H 140 km away.	To determine the social costs of providing a rural population with radiology services under three different systems: most exams at remote site, teleradiology, or at the host site.	RCT Cost minimization study assuming that all three options have the same health consequences	Including annual direct medical costs, direct non-medical (travel) costs, and indirect (lost production) costs. Use of clinical records and administrative data. Sensitivity analysis and discounting.	randomly selected sample (n = 597) of all patients (n = 1793) having radiological examinations in 1993. Records were available for 553.	Diagnostic services via radiology, as compared to in person	N/A – all exams from one year eligible for review	After exclusion of costs common to the three systems total costs of the three options were £91,500 for the existing system; £123 500 for the teleradiology option; and £117 000 for the "all at host" option. Sensitivity analyses indicated that the existing system is the least costly option except when lost leisure is valued as highly as lost production.	Authors note that cost of teleradiology may be underestimated

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Hayes WS, Tohme WG, Komo D, Dai H, Persad SG, Benavides A et al. A telemedicine consultative service for the evaluation of patients with urolithiasis. Urology 1998; 51(1):39-43. **USA** Georgetown University Medical Center, and H in Virginia	To assess the effectiveness of telemedicine on the clinical decision-making process for patients with urolithiasis.	Case control study (treatment plan before and after telemedicine consultation).	Consulting urologist recorded treatment options after the "usual" telephone consultation, after the telemedicine consultation, and after examination of the patient if the patient was transferred.		Consultation between a referring urologist and 14 patients in the clinical trial group and 18 in a simulated study group.		Recommendation of the consulting urologist at the tertiary center was altered in 12/32 (37.5 %) of cases after the telemedicine consultation.	4/14 in clinical trial group did not have urolithiasis. Less clinical detail is provided for the simulated study group.

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Heautot JF, Gibaud B, Catroux B, Thoreux PH, Cordonnier E, Scarabin JM et al. Influence of the teleradiology technology (N-ISDN and ATM) on the inter-hospital management of neurosurgical patients. Med Inform Internet Med 1999; 24(2):121-134. **France** Link between a general H and a university H	To assess the influence of teleradiology in the context of neurosurgical emergencies.	Comparison of pre-telemedicine and telemedicine groups, log files and questionnaires.	Evaluation based on records of advice request calls and patient transfers.	11 pre-telemedicine, 51 ISDN and 46 ATM neurosurgical cases, respectively.	teledaiology consult		16- 50% of unnecessary patient transfers were avoided using ISDN and ATM submissions, respectively. Advice requests increased fourfold, and non-urgent advice requests increased from 0 to 21%.	Focus on transfers made and avoided does not extend to subsequent patient history.

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Johnson MA, Davis P, McEwan AJ, Jhangri GS, Warshawski R, Gargum A et al. Preliminary findings from a teleultrasound study in Alberta. Telemed J 1998; 4(3):267-276. **Canada** Alberta	To evaluate the adequacy of teleultrasound service in High Level, Alberta with remote sonologist supervision from Edmonton.	A prospective observational study		146 patients requiring ultrasound examination	Group A (n = 72) was evaluated by both an on-site radiologist in High Level and a remote supervising radiologist in Edmonton. Group B (n = 74 patients) was evaluated only by the remote supervising radiologist in Edmonton		teleultrasound service made transfer unnecessary in 42% of patients	Some data missing for analysis

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Lehmann KJ, Walz M, Bolte R, Georgi M, Schinkmann M, Busch C. [Possible applications of the KAMEDIN teleradiology system with special reference to an economic analysis.] [German.] Radiologe 1997;37:278-284. **Germany** Mannheim	To evaluate the cost-effectiveness of a teleradiology system under three different scenarios.	Cost-benefit analysis.	A break-even analysis with respect to costs of hardware, software, support, use of ISDN and staff, as well as benefits like the decrease in transportation or film documentation cost. Sensitivity analysis.	Establishment of a teleconference system in the intensive care unit within the hospital, with an external workstation in a radiology department (6 km away) and with a radiologist on duty (22 km away).	Transmission of CT examinations from one workstation to another		Two applications (intensive care and external PC) showed a break-even at 1817 and 528 teleconferences/ year, respectively. When all optimisation factors were combined, the break-even decreased to a minimum of 167 and 77 teleconferences/ year, respectively.	Not all cost elements are specified.

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Maass M, Kosonen M, Kormano M. Transportation savings and medical benefits of a teleneuroradiological network. J Telemed Telecare 2000; 6(3):142-146. **Finland** Turku University Central H	To identify possible transport savings and medical benefits of a teleconsultation network.	Retrospective survey of the teleconsultations. Medical records and the relevant radiology images were obtained.		83 patients at three centres requiring specialist radiological examination	teleradiology		16 patients were transported to the university hospital (i.e. 81% had avoided unnecessary transportation). The total savings amounted to 42,100 ECU, including two cases from an island location who had to be transported by military helicopter. Savings for the the two mainland locations were 7,600 ECU and 6,000 ECU.16 patients were transported to the university hospital (i.e. 81% had avoided unnecessary transportation). The total savings amounted to 42,100 ECU, including two cases from an island location who had to be transported by military helicopter. Savings for the the two mainland locations were 7,600 ECU and 6,000 ECU.	

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Malone FD, Athanassiou A, Craigo SD, Simpson LL, D'Alton ME. Cost issues surrounding the use of computerized telemedicine for obstetric ultrasonography. Ultrasound Obstet Gynecol 1998; 12(2):120-124. **USA** 3 offices transmitting 600 ultrasound exams/month to a tertiary facility in Boston	To describe cost implications of converting an established videotape review network to one based on telemedicine technology.	Retrospective review of costs associated with interpreting obstetric ultrasound examinations. Fixed and non-fixed costs included.			teleultrasound		Net monthly savings in non-fixed costs for a telemedicine network are $ 7405-8585, which may pay for the initial fixed costs in 12-14 months.	Authors draw attention to limitations of their cost study, which relates to experimental conditions.

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Poon WS, Leung CH, Lam MK, Wai S, Ng CP, Kwok S. The comparative impact of video-consultation on neurosurgical health services. Int J Med Inf 2001; 62(2-3):175-180. **China** Hong Kong, large teaching H	To evaluate the impact of telemedicine technology on neurosurgical services - differences between the use of real time audio-visual teleconferencing and teleradiology versus conventional telephone consultations	RCT 10-month period	Measures of effectiveness included diagnostic accuracy and adverse events during the transfer and Glasgow Outcome Score.	N= 327 requiring emergency neurosurgical consultation were recruited and randomized into the study: the male/female ratio was 2:1 and the number of patients required to be transferred to the neurosurgical unit was 125 (38%).	randomization into telephone consultation only (Mode A), teleradiology and telephone consultation (Mode B) and video-consultation (Mode C)	One month outcome assessment on n=289	There was a trend towards a more favourable outcome in the video-consultation mode (44%, Mode C), versus teleradiology (31%, Mode B), versus telephone consultation (38%, Mode A). However 'failure rates' – in terms of information exchange – was 53.4% for (C) compared with 1.2% for (B) and zero for (A)	Numbers in each arm of the study are not given. Nor are actual outcomes scores. No statistical analysis. There seems a mismatch between the failure rate and clinical outcomes for method (C)

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Spencer JA, Dobson D, Hoare M, Molyneux AJ, Anslow PL. The use of a computerized image transfer system linking a regional neuroradiology centre to its district hospitals. Clinical Radiology 1991;44:342-44. **UK** Regional neuroradiology department in Oxford	To assess the benefits of a system linking a regional neuroradiology department to 6 referring district general hospitals	cohort	Diagnoses and management plans made by referring clinicians and radiologists before image transfer were compared with the scan diagnoses of the consulting neuroradiologists and the revised management plans after obtaining neurosurgical/neuro-radiological advice.		150 consecutive CT-scans of which 77 were from neurosurgical cases referred for urgent advice and 73 for other specialist advice.		A significant change in management plan occurred after image transfer in 81% of the neurosurgical cases , principally through avoidance of unnecessary patient transfer..	No data on actual management of patients in absence of telemedicine.

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Steckel RJ, Batra P, Johnson SL, Zucker M, Mao JT, Sayre J et al. Home teleconsultations with faculty subspecialists on chest images from an intensive care unit. Emergency Radiology 2000; 7(4):206-211. **USA** UCLA School of Medicine, Los Angeles	To determine whether teleconsultations by first-year radiology residents with faculty thoracic radiologists, using diagnostic-quality teleradiology workstations in the radiologists' homes, would add clinical value for the acute management of intensive care unit patients after regular working hrs.	Comparison of findings of first-year radiology residents on new computed chest radiographs and revised findings after consulting with home-based thoracic radiologists via teleradiology,		173 cardiothoracic intensive care unit patients	Teleconsultation with specialist		In 119 of the 173 cases (69%), differences in key findings on the chest images were observed between the first-year residents' preliminary readings and their revised readings after teleconsultation. Changes in key findings after the teleconsultations could have influenced acute patient care in 86 of the 173 cases (50%).	

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Stoeger A, Strohmayr W, Giacomuzzi SM, Dessl A, Buchberger W, Jaschke W. A cost analysis of an emergency computerized tomography teleradiology system. J Telemed Telecare 1997; 3(1):35-39. **Austria** University H in Innsbruck, Regional H in Zwettl	To study the costs of an emergency CT service provided to a remote hospital by the use of teleradiology.	Economic analysis.	Comparison of teleradiology costs with two alternatives: "non-digital radiology" in which films were sent by taxi to the nearest centre for reporting, and transport of the patient to the nearest central hospital for scanning and subsequent reporting. Analysis did not take the capital costs of CT scanners into account (already installed in each hospital). Maintenance costs and expenses for personnel in the remote hospital not considered because an equal amount was subtractable at the diagnostic centre where patients were transferred before teleradiology.	121 emergency examinations of 116 patients	teleradiology – exam results were transmitted from Zwettl to Innsbruck		The average cost of one emergency CT examination by teleradiology was DM 372. Transporting the films by taxi for reporting elsewhere, was cheaper (estimated cost DM 156), but would have been much slower. Transporting the patient to the nearest central hospital for scanning, was much more expensive: DM 524 by road or DM 4667 by helicopter ambulance.	

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Swingler GH, Zwarenstein M. Telephone follow-up in a randomized controlled trial in a less developed country: Feasibility, validity and representativeness. Journal of Clinical Epidemiology 2000; 53(3):331-334. **South Africa** Children's H in Cape Town	Assess feasibility and effect of telephone follow up of children who had chest radiography	Patients with telephone access enrolled and followed up; they included children who had been enrolled in an RCT. Feasibility of telephone follow up assessed on all telephone access population, clinical outcomes on those enrolled in RCT, and compared with non-telephone access RCT participants. Note: details of RCT reported elsewhere (Lancet 1998;351:404-8).	Chi-square for differences in categorical data. Agreement as kappa statistic	Children who had had chest radiography	Hospital-based clinical outcomes were measured from hospital records, and also by telephone, in a subset of the same patients who offered a contact telephone number.	398 offered phone numbers, 321 contacted, 281 followed to recovery, 28 censored at 28 days. Clinical comparison on n=295 with telephone, n=227 without	Of 398 subjects offering a telephone number 308 (77.4%) were followed to recovery or for 28 days. Kappa statistics for a subsequent hospital visit, hospital admission, and chest radiograph were 0.88, 0.83, and 0.56, respectively. The effect of chest radiography did not differ significantly in participants accessible and not accessible by telephone. Cost per subject successfully followed up $2.31 compared with estimated $7.54 per case for a face to face interview.	Details of cost estimates are not provided

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Teslow TN, Gilbert RA, Grant WH, III, Woo SY, Butler EB, Liem JH. A teleradiology case conference system. Journal of Telemedicine & Telecare 1995; 1(2):95-99. **USA** Major medical centers in Houston	To investigate whether the use of a teleradiologic case conference system can improve communication about X-ray images amongst oncologists located at different sites.	Radiation oncology residents and staff reviewed cases either by the teleradiologic case conference system or by conferences in person over a period of 8 months.		83 teleradiology case conference cases, 276 in person conference cases			Case conferences with the teleradiology system influenced changes in treatment planning as effectively as those conducted in person. Treatment planning outcomes were equivalent.	Advantages claimed for telemedicine were not reflected by the reported outcomes.

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Tually P, Walker J, Cowell S. The effect of nuclear medicine telediagnosis on diagnostic pathways and management in rural and remote regions of Western Australia. J Telemed Telecare 2001; 7 Suppl 2:50-53. **Australia**	to describe the effect of nuclear medicine telediagnosis (NMT) on referral patterns and delivery of care.	Surveys, use of administrative data		209 medical practitioners in remote and rural areas of the state	NMT		Substantial increase in proportion of practioners complying with Clinical Practice guideline recommendations for musculoskeletal and oncology cases, in comparison with pre NMT and with non-NMT regions. NMT input led to the detection of disease and a change to therapeutic management in 122 cases and eliminated the need to transfer patients to another facility for unnecessary and expensive examinations in 38	Only sparse details presented, none for non –NMT centres. While reference to costs is made in the conclusions, no cost data are presented.

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APPENDIX J: CRITIQUE TELERADIOLOGY

Policy Recommendations	**Applicability to Alberta**	**Comments**
Concluded that the neurosurgical wide-area computer network has led to more appropriate transfer of patients to a tertiary facility and significant estimated cost savings	Applicable in principle	
not specific	Approach taken is applicable	

Note: Abbreviations used in this document are described in Appendix D

APPENDIX J: CRITIQUE TELERADIOLOGY

Policy Recommendations	**Applicability to Alberta**	**Comments**
Indicate favourable experience and suggest expanding to other regions.	seems applicable, in principle	Satisfaction of patients and physicians covered in study, not considered here.

Note: Abbreviations used in this document are described in Appendix D

APPENDIX J: CRITIQUE TELERADIOLOGY

Policy Recommendations	Applicability to Alberta	Comments
The authors conclude that "The positive consequences of the introduction of the telemedicine service included more rapid diagnosis and treatment, improved quality of service, and the transfer of skills and education. A costs-consequences analysis suggested that the telemedicine service was worthwhile"	Not directly applicable.	Study does give indications of social benefits through availability of telemedicine, however anecdotal reports only

Note: Abbreviations used in this document are described in Appendix D

APPENDIX J: CRITIQUE TELERADIOLOGY

Policy Recommendations	Applicability to Alberta	Comments
Also satisfaction surveys, not considered here.	Applicable where necessary	

Note: Abbreviations used in this document are described in Appendix D

APPENDIX J: CRITIQUE TELERADIOLOGY

Policy Recommendations	**Applicability to Alberta**	**Comments**
None specific, but strongly supportive of the use of this telemedicine link.	Applicable	Backgound to the study is provided by the earlier paper. Process details, satisfaction and quality issues mentioned are not considered here.

Note: Abbreviations used in this document are described in Appendix D

APPENDIX J: CRITIQUE TELERADIOLOGY

Policy Recommendations	**Applicability to Alberta**	**Comments**
Authors suggest the system was well received by both referring physicians and patients [survey]	Scenarios not directly applicable to Alberta	

Note: Abbreviations used in this document are described in Appendix D

APPENDIX J: CRITIQUE TELERADIOLOGY

Policy Recommendations	**Applicability to Alberta**	**Comments**
The authors concluded that the study provided evidence to justify greater use of domiciliary support for women with pregnancies of moderately high risk. There were useful practical advantages for both patients and the health service. Strong indication of usefulness of domiciliary approach for both patients and providers.	Appropriate technology	Telemedicine was only one component of the intervention.

Note: Abbreviations used in this document are described in Appendix D

APPENDIX J: CRITIQUE TELERADIOLOGY

Policy Recommendations	Applicability to Alberta	Comments
Digital intraoperative specimen radiography considerably reduces the time of surgery depending on the local conditions	potentially applicable	Pilot study with prototype machine

Note: Abbreviations used in this document are described in Appendix D

APPENDIX J: CRITIQUE TELERADIOLOGY

Policy Recommendations	Applicability to Alberta	Comments
Good evidence of benefit from the system for managing neurosurgical emergencies.	Applicable	

Note: Abbreviations used in this document are described in Appendix D

APPENDIX J: CRITIQUE TELERADIOLOGY

Policy Recommendations	Applicability to Alberta	Comments
Probable influence on decisions for hospitals in the AP HP group advised by this assessment group.	Cost and level of use considerations are matters to be considered in any application in Alberta	

Note: Abbreviations used in this document are described in Appendix D

APPENDIX J: CRITIQUE TELERADIOLOGY

Policy Recommendations	Applicability to Alberta	Comments
Supportive of service, suggest further evaluation.	Applicable for remote sites.	Authors note that women with normal fetuses can be reassured over the telemedicine link while many with straightforward abnormalities can have the diagnosis confirmed and be counseled without having to travel.

Note: Abbreviations used in this document are described in Appendix D

APPENDIX J: CRITIQUE TELERADIOLOGY

Policy Recommendations	Applicability to Alberta	Comments
provision of acceptable teleradiology requires considerable attention to all aspects of the radiology service, with attention to differences in institutional culture and mission, and to communication.	Need to consider broadly the aspects of service provision is applicable	

Note: Abbreviations used in this document are described in Appendix D

APPENDIX J: CRITIQUE TELERADIOLOGY

Policy Recommendations	Applicability to Alberta	Comments
Potential advantages of this system in facilitating safer transfers and faster management of neurosurgical emergencies merit further attention.	General principle is applicable.	

Note: Abbreviations used in this document are described in Appendix D

APPENDIX J: CRITIQUE TELERADIOLOGY

Policy Recommendations	Applicability to Alberta	Comments
The teleradiology option did not seem to be cost saving in the study community. The authors suggest that telemedicine may be justified on equity and quality grounds, though there are no data on these points. Potential general guidance for decision makers on issues to consider.	Methodology is applicable and issues are worth considering in the context of provincial radiology services	

Note: Abbreviations used in this document are described in Appendix D

APPENDIX J: CRITIQUE TELERADIOLOGY

Policy Recommendations	Applicability to Alberta	Comments
In the evaluation of patients with urolithiasis, this telemedicine application enhanced the clinical decision-making process by allowing for improved quality of care through immediate access and effective transfer of information between the referring urologist, the patient, and the stone center specialist	Potentially	

Note: Abbreviations used in this document are described in Appendix D

APPENDIX J: CRITIQUE TELERADIOLOGY

Policy Recommendations	Applicability to Alberta	Comments
Teleradiology can improve the relations between hospitals through an increase of urgent and non-urgent advice requests.	Applicable	Satisfaction issues not considered here

Note: Abbreviations used in this document are described in Appendix D

APPENDIX J: CRITIQUE TELERADIOLOGY

Policy Recommendations	Applicability to Alberta	Comments
Teleultrasound service to High Level could be provided reliably with remote supervision, comparable to direct on-site supervision	Study from Alberta	Material on quality of images and satisfaction of sonographers and patients not considered here.

Note: Abbreviations used in this document are described in Appendix D

Policy Recommendations	Applicability to Alberta	Comments
not specific	methodological approach is applicable, data are not.	A later publication from this group present the same findings and has not been analysed [Walz M, Bolte R, Lehmann KJ, Lutgemeier J, Georgi M. Economic analysis of teleradiology applications with KAMEDIN. Stud Health Technol Inform 1999; 64:208-216.;]

Note: Abbreviations used in this document are described in Appendix D

APPENDIX J: CRITIQUE TELERADIOLOGY

Policy Recommendations	**Applicability to Alberta**	**Comments**
Supportive of service. In 1998 the teleradiology consultation service was established as part of the routine work of the Medical Imaging Centre and a fee for its services was adopted.	Applicable where necessary	

Note: Abbreviations used in this document are described in Appendix D

APPENDIX J: CRITIQUE TELERADIOLOGY

Policy Recommendations	Applicability to Alberta	Comments
The high cost of a telemedicine network may be offset by possible savings in non-fixed costs compared with alternative systems for interpreting obstetric ultrasonography	Applicable	

Note: Abbreviations used in this document are described in Appendix D

APPENDIX J: CRITIQUE TELERADIOLOGY

Policy Recommendations	Applicability to Alberta	Comments
Authors indicate the interim data suggests that video-consultation may have a favourable impact on emergency neurosurgical consultations	Video and teleradiology applicable and have been used; this study does not offer anything new	A weak study with insufficient detail and apparently inconsistent results. Little more than feasibility is established.

Note: Abbreviations used in this document are described in Appendix D

APPENDIX J: CRITIQUE TELERADIOLOGY

Policy Recommendations	Applicability to Alberta	Comments
Strong indication to continue this service. Authors note that use of the telemedicine system continued to increase after the end of the study.	Approach is applicable	

Note: Abbreviations used in this document are described in Appendix D

APPENDIX J: CRITIQUE TELERADIOLOGY

Policy Recommendations	Applicability to Alberta	Comments
Diagnostic workstations in the homes of faculty subspecialists may enable first-year radiology residents on night or weekend duty to obtain clinical supervision from faculty subspecialists that approximates more closely the level of supervision that they receive during regular working hours	Seems applicable	

Note: Abbreviations used in this document are described in Appendix D

APPENDIX J: CRITIQUE TELERADIOLOGY

Policy Recommendations	Applicability to Alberta	Comments
Teleradiology suitable for practical emergency service in a remote hospital.	General principles applicable, details less generalizable.	

Note: Abbreviations used in this document are described in Appendix D

APPENDIX J: CRITIQUE TELERADIOLOGY

Policy Recommendations	Applicability to Alberta	Comments
Telephone follow-up was feasible and produced valid and generalizable results at low cost.	Probably limited applicability in Alberta setting, though telephone follow up might be considered for some remote communities if not already in place	Authors note convenience of telephone approach to interviewers and their clients – avoidance of travel, use of convenient times for interview – though no data included on these points. Note, this study might also be included under Pediatrics.

Note: Abbreviations used in this document are described in Appendix D

APPENDIX J: CRITIQUE TELERADIOLOGY

Policy Recommendations	Applicability to Alberta	Comments
"The teleradiology system facilitated quality assurance through review of patients' radiation treatments by allowing natural interactive consultation"	In principle, applicable	

APPENDIX J: CRITIQUE TELERADIOLOGY

Policy Recommendations	Applicability to Alberta	Comments
"While NMT is more costly than conventional nuclear medicine services, it permits faster access to specialist consultation, provides for better management and is likely to reduce overall health costs by reducing the volume of inappropriate tests and treatment practice"	In principle, as needed	

Note: Abbreviations used in this document are described in Appendix D

APPENDIX K: CRITIQUE RENAL TELEHEALTH

Author/ Article Title/ Year/ Country	Purpose/Objectives	Design	Analysis	Participants: age/ gender/groups	Intervention/ Duration	Follow-up: sample size; dropout	Outcomes/Socio-Economic Indicators
Agroyannis B, Fourtounas C, Romagnoli G, et al. Telemedicine technology and applications for home haemodialysis. The International Journal of Artificial Organs. 1999; 22(10): 679-683. Greece / Italy.	HOMER-D project. To combine home haemodialysis with telematics monitoring services to support home or satellite haemodialysis patients. This paper describes the application of telematics monitoring services (TMS) for supporting patients who need home or satellite home haemodialysis (HD)	Selected patients with informed consent	Descriptive	Haemodialysis patients n=9 patients were selected for the clinical trials and gave informed consent	Performance of routine HD transmitting i) HD machine related parameters, and ii) patient related parameters, to a remote location.	150 sessions with 9 patients over 5 months	All patients had adequate HD treatment (as per Kt/V); all patient and HD machine parameters (including alarms) were transmitted correctly. Patients and partners expressed willingness to continue with e-health facilitated HD – ascribed to increased confidence / reduced anxiety HD may give better medical rehab and more independence; convenience for patient

Note: Abbreviations used in this document are described in Appendix D

Author/ Article Title/ Year/ Country	Purpose/Objectives	Design	Analysis	Participants: age/ gender/groups	Intervention/ Duration	Follow-up: sample size; dropout	Outcomes/Socio-Economic Indicators
Bellazzi R, Magni P, Bellazzi R. Improving dialysis services through information technology: from telemedicine to data mining. MEDINFO, 2001: 795-799. Italy.	Present organizational issues related to a teledialysis service between a central and satellite site, and provide preliminary results Paper discusses the issues related to the use of IT solutions in dialysis and describes the implementation of some of them in a medium size dialysis centre	n/a	Projected time and cost savings from eliminated travel to distant site	Not specified – appeared to be all current HD patients	Video-conference connect to monitor dialysis sessions and assist with treatment planning	Not specified	Projected savings of : 25 trips (1,512 hours) p.a. for physicians, nurses and technicians; equivalent to ~9,500 Euros in personnel costs

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APPENDIX K: CRITIQUE RENAL TELEHEALTH

Author/ Article Title/ Year/ Country	Purpose/Objectives	Design	Analysis	Participants: age/ gender/groups	Intervention/ Duration	Follow-up: sample size; dropout	Outcomes/Socio-Economic Indicators
Cresswell S, Hicks K. A new modem-based communication link for paediatric home peritoneal dialysis patients. Dialysis and Transplantation, 1996; 25 (9): 586-590. Canada	Determine feasibility of monitoring home peritoneal dialysis (PD) by modem link to home unit.	Case study	Descriptive	One 2.5 year old male who before being on treatment had several problems including frequent vomiting, hyperkalemia, peritonitis, and many machine malfunctioning problems.	Transfer to new device capable of transmitting cycle data via modem The patient's family transfers data via modem from their home to the B.C. Children's Hospital. Information transmitted to nurse clinician who was able to identify problems and adjust treatment; nurse clinician generated monthly report to identify trends in patient's treatment	1 year	Ready access to expert support Reduced family stress Reduction in transportation Improved quality of life for patient and family Improved patient health status

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APPENDIX K: CRITIQUE RENAL TELEHEALTH

Author/ Article Title/ Year/ Country	Purpose/Objectives	Design	Analysis	Participants: age/ gender/groups	Intervention/ Duration	Follow-up: sample size; dropout	Outcomes/Socio-Economic Indicators
Currell R, Urquhart C, Wainwright P, Lewis R. Telemedicine versus face to face patient care: effects on professional practice and health care outcomes (Cochrane Review). In: The Cochrane Library, Issue 2; 2002. Oxford.UK	To assess the effects of telemedicine as an alternative to face-to-face patient care.	Review Study (7 studies; all randomized controlled trials)	Objective measures of provider performance or patient outcome. Data summarized & presented in natural units	Qualified health care practitioners. Patients receiving care from any qualified hc practitioner through the medium of telemedicine compared to those receiving equivalent face-to-face care	5 concerned with use of telecommunications to support care of homecare or patient self-monitoring of chronic disease, e.g., POTS; using monitors for heart rate, ECG, blood glucose levels. 2 involved GP's & Emergency/OPD Dept consults	Sample sizes small. Groups well matched. Drop-out rates not reported but comment on initial eligibility & dropping out over time.	Few significant differences between groups, i.e., little evidence of clinical benefits. Significant improvement in medication adherence in non-adherent patients. Significant within-group improvements in physiological measures after cardiac exercise program. Trend toward higher level of satisfaction in intervention group. No data to support changes in physician behaviour. Experimental group motivated by regular contact with hcp's. Transfer of skills between clinicians not addressed. Feasible to use TM systems. No detrimental effects reported.

Note: Abbreviations used in this document are described in Appendix D

APPENDIX K: CRITIQUE RENAL TELEHEALTH

Author/ Article Title/ Year/ Country	Purpose/Objectives	Design	Analysis	Participants: age/ gender/groups	Intervention/ Duration	Follow-up: sample size; dropout	Outcomes/Socio-Economic Indicators
Going, E. Telehealth in dialysis: The Simcoe County experience. CANNT. Orillia, Ontario, Canada.	Article describes the implementation of a TM system for dialysis patients in Ontario	Descriptive	Not reported		Currently conducting monthly haemodialysis follow-up clinics through v/c which eliminates need for patients to travel to see doctors Clinic is conducted one morning per month and during the appointment the patient and nephrologist meet f/f, and see and hear each other in real time picture	Monthly follow-ups	Applications for telehealth in dialysis are discussed and include: -Immediate assessment of the patient in the satellite unit if a problem develops -Access to continuing education for health care professionals in remote areas -Reduction in travel time Some problems with the application are also noted: -User inexperience -Infrastructure in Canada has not developed enough to the point where it could support telehealth -Fear of technology Informal questioning revealed patient satisfaction with the service

Note: Abbreviations used in this document are described in Appendix D

APPENDIX K: CRITIQUE RENAL TELEHEALTH

Author/ Article Title/ Year/ Country	**Purpose/Objectives**	**Design**	**Analysis**	**Participants: age/ gender/groups**	**Intervention/ Duration**	**Follow-up: sample size; dropout**	**Outcomes/Socio-Economic Indicators**
Mitchell JG, Disney APS. Clinical applications of renal telemedicine. Journal of Telemedicine and Telecare, 1997; 3:158-162. Australia	Improve quality of patient care; Facilitate management of dialysis centres; Provide professional development	Collation of usage data; observations of use Formal structured interviews were conducted in mid-1995 and mid-1996, questions were open encouraging participants to provide additional information	Descriptive.	Persons interviewed included specialists, registrars, interns, allied health staff, and nurses n=18	Telemedicine network linking hospital to three satellite dialysis centres using live audio-visual connects. -The v/c facilities were used 3000 times during the 12 months from mid-1995 to mid-1996, an average of 250 monthly users	3,000 contacts over 1 yr	No SE measures.

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APPENDIX K: CRITIQUE RENAL TELEHEALTH

Author/ Article Title/ Year/ Country	Purpose/Objectives	Design	Analysis	Participants: age/ gender/groups	Intervention/ Duration	Follow-up: sample size; dropout	Outcomes/Socio-Economic Indicators
Moncrief JW. Telemedicine in the care of the end-stage renal disease patient. Advances in Renal Replacement Therapy. 1998, 5(4): 286-291. USA	Evaluate use of interactive video to monitor HD patients in a distant rural community	Descriptive.	Author participated in the Texas Telemedicine Project (TTM) During 2 year project dialysis patients were monitored and primary care was delivered through the electronic medium	During the 2 year study, 1500 individual patient contacts were made in which the system was taken directly to the patient dialysis station	2 year project Contact established at 6am between primary and the satellite unit and this contact remained in place during the entire dialysis session Physician was electronically available throughout the dialysis procedure 5 days/week	Not specified	Study reports patients were almost universally enthusiastic, supportive, and delighted to participate in the project Patients express appreciation on the availability of physician via TM Reduction of patient transportation Cost saving

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Author/ Article Title/ Year/ Country	Purpose/Objectives	Design	Analysis	Participants: age/ gender/groups	Intervention/ Duration	Follow-up: sample size; dropout	Outcomes/Socio-Economic Indicators
Mun, SK. Agency: National Library of Medicine; Project Phoenix: Scrutinizing a Telemedicine Test bed. Final Report, June 30, 2000. [On line]	To evaluate the role of TM in a dialysis centre	Controlled study, non-randomized; data were collected from 2 groups--one receiving conventional care and the other conventional care supplemented by TM interventions	Data included Kt/V results, validated quality of life measurements, and patient satisfaction survey findings Multivariate analysis				Patients tended to be satisfied with their medical treatment with no significant differences in satisfaction between the two groups Small cost savings found

Note: Abbreviations used in this document are described in Appendix D

Author/ Article Title/ Year/ Country	Purpose/Objectives	Design	Analysis	Participants: age/ gender/groups	Intervention/ Duration	Follow-up: sample size; dropout	Outcomes/Socio-Economic Indicators
Nakamoto H, Hatta M, Tanaka A, et al. Telemedicine system for home automated peritoneal dialysis. Advances in Peritoneal Dialysis. 2000; 16: 191-194. Japan.	Safe and effective monitoring of elderly or handicapped patients that use an automated PD system to perform CAPD at home.	Aim of the study were to a. develop a new TM system for patients using an APD system to perform CAPD at home and b. to examine whether such a system will effectively and safely monitor elderly and handicapped patients undergoing CAPD and c. to ensure the efficacy of the system in producing a beneficial effect on quality of life and reducing problems and accidents	Descriptive	Elderly or handicapped patients undergoing CAPD. The study reports they are currently using the TM system on 7 elderly and handicapped patients.	Introduction of an APD into routine CAPD procedure to monitor process. 1 to 6 months (average 3 months).	7 elderly or handicapped patients. Ongoing.	QoL 'improved' No major problems / accidents. Permits remote adjustment of CAPD parameters.

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APPENDIX K: CRITIQUE RENAL TELEHEALTH

Author/ Article Title/ Year/ Country	Purpose/Objectives	Design	Analysis	Participants: age/ gender/groups	Intervention/ Duration	Follow-up: sample size; dropout	Outcomes/Socio-Economic Indicators
Picot J, Heaton L, Robichaud S, et al. Qualitative Evaluation of a Tele-dialysis Pilot Project. Presentation, June, 2001.	Infotelemed Communications Inc was awarded a contract to evaluate the tele-nephrology project in New Brunswick. Factors to be studied are quality of service, cost-effectiveness, clinical effectiveness, health impacts, user satisfaction and transferability	Review project	Qualitative and quantitative methods used Self administered questionnaires for patients and family Mail back questionnaires (for members of personnel) Analysis of patient clinical charts, observations, log books, focus groups, content analysis 211 of 336 distributed questionnaires were analyzed	35 consenting patients and family members 28 members of personnel 31 decision makers, stakeholders	9 case conferences, 6 distance education sessions, and 158 individual teleconsultations generated 183 questionnaires or encounter forms		Quality of service judged positive or very positive by majority of clients Users indicated improved acceptance to technology over time Reduction in travel time for patients Most participants satisfied with accessibility Clinical effectiveness reported including improvements and increase in physical activity Found cost effective

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APPENDIX K: CRITIQUE RENAL TELEHEALTH

Author/ Article Title/ Year/ Country	Purpose/Objectives	Design	Analysis	Participants: age/ gender/groups	Intervention/ Duration	Follow-up: sample size; dropout	Outcomes/Socio-Economic Indicators
Stroetmann KA, [illegible]cher P, [illegible]ann VN. Improving the quality of life for dialysis patients through telecare. 2000. Germany	Explore possibility of improving homecare for dialysis patients.	Pilot study. Survey – KDQoL-SF v1.2. Patient interviews. Clinician interviews.	Descriptive	Ongoing	Introduction of video-based support using videophones.	Ongoing	Preliminary only. Patients satisfied. Provides them with additional security. Technical difficulties wasted professional and patient time.

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APPENDIX K: CRITIQUE RENAL TELEHEALTH

Author/ Article Title/ Year/ Country	Purpose/Objectives	Design	Analysis	Participants: age/ gender/groups	Intervention/ Duration	Follow-up: sample size; dropout	Outcomes/Socio-Economic Indicators
Tohme WG, Winchester JF, Collman J, et al. Remote management of haemodialysis patients: design and implementation of a telemedicine network. Min Invas Ther & Allied Technol. 1997; 5/6: 421-428. USA	Project Phoenix; Study impact of e-health on access, cost, and quality of care for haemodialysis patients.	Controlled study, non-randomized; e-health vs. no e-health..	Study ongoing	Study ongoing at time of report.	Multimedia network linking hospital, satellite site, and physicians home.	Study ongoing	Study ongoing

Note: Abbreviations used in this document are described in Appendix D

APPENDIX K: CRITIQUE RENAL TELEHEALTH

Methodological Problems	**Policy Recommend-ations**	**Applicability to Alberta**
Non RCT, regular patients without unusual symptoms studied.	Potential for increase in home or satellite HD with remote monitoring identified.	Yes. Potential area of application.

Note: Abbreviations used in this document are described in Appendix D

APPENDIX K: CRITIQUE RENAL TELEHEALTH

Methodological Problems	Policy Recommendations	Applicability to Alberta
Not a structured evaluation	Ensure structured evaluations are conducted to provide evidence base	Yes. Potential area of application.

Note: Abbreviations used in this document are described in Appendix D

APPENDIX K: CRITIQUE RENAL TELEHEALTH

Methodological Problems	Policy Recommendations	Applicability to Alberta
Limited to case study only	Need for thorough study to truly assess potential SE impacts and value to healthcare system	Yes. Potential area of application. Demonstrates viability of data transfer from patients' homes.

APPENDIX K: CRITIQUE RENAL TELEHEALTH

Methodological Problems	Policy Recommendations	Applicability to Alberta
Few studies and heterogeneity prevented pooled statistical analysis. No studies included formal economic analysis.	Be cautious about recommending increased use and investment in unevaluated technologies. Ensure clinical application for proposed application is established first. Telemedicine may result in fundamental changes in practice.	Yes. Potential area of application.

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APPENDIX K: CRITIQUE RENAL TELEHEALTH

Methodological Problems	**Policy Recommendations**	**Applicability to Alberta**
No information provided regarding how the original study was conducted, i.e.. No info about participants	Telehealth is a human activity, and must move from a stand alone operation to an integrated part of our health care system	Yes. Potential area of application.

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APPENDIX K: CRITIQUE RENAL TELEHEALTH

Methodological Problems	Policy Recommendations	Applicability to Alberta
Lack of details on timings for equipment usage; lack of cost effectiveness data; lack of assessment of any change in clinical service resulting from network links.	Need for thorough study to truly assess potential SE and healthcare impacts	Yes. Potential area of application.

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APPENDIX K: CRITIQUE RENAL TELEHEALTH

Methodological Problems	**Policy Recommendations**	**Applicability to Alberta**
No information provided regarding how the original study was conducted, i.e.. No info about participants	Increased access to care for rural patients should foster a new philosophy of shared information, maintenance of quality, and support of patient care management in the patient's community and at their convenience All parties involved in the system should benefit from improvement in convenience, better access, lower costs, and improved care	Yes. Potential area of application.

Note: Abbreviations used in this document are described in Appendix D

APPENDIX K: CRITIQUE RENAL TELEHEALTH

Methodological Problems	Policy Recommend-ations	Applicability to Alberta
		Yes. Potential area of application.

Note: Abbreviations used in this document are described in Appendix D

APPENDIX K: CRITIQUE RENAL TELEHEALTH

Methodological Problems	Policy Recommendations	Applicability to Alberta
Not a systematic study. No evidence provided to substantiate claims (QoL and problems / accidents).	None	Yes. Potential area of application.

Note: Abbreviations used in this document are described in Appendix D

Methodological Problems	Policy Recommend-ations	Applicability to Alberta
	Project could be transferred or generalized to other locations (established by focus groups verified though interviews)	Yes. Potential area of application.

Note: Abbreviations used in this document are described in Appendix D

APPENDIX K: CRITIQUE RENAL TELEHEALTH

Methodological Problems	**Policy Recommendations**	**Applicability to Alberta**
	Develop a e-health service framework and patient handbook prior to implementing any proposed e-health solution. Ensure technology works perfectly before attempting telehealth.	Yes. Potential area of application.

Note: Abbreviations used in this document are described in Appendix D

Methodological Problems	Policy Recommend-ations	Applicability to Alberta
Study ongoing	Establish a clinical operational protocol that details how the e-health system is to be used in the routine clinical setting first.	Yes. Potential area of application.

Note: Abbreviations used in this document are described in Appendix D

APPENDIX L: RURAL REMOTE

#	Author / Title / Journal / Year / Country	Purpose/ Objectives	Design	Analysis	Participants: age/ gender/ groups
1	Boulanger B, Kearney P, Ochoa J, Tsuei B, Sands F. Telemedicine: a solution to the follow-up of rural trauma patients? J Am Coll Surg 2001: 447-452. **USA** Kentucky	To evaluate the early experience (re. feasibility & satisfaction) with TM-based outpatient follow-up of adult trauma victims discharged to areas remote from the Level I trauma centre.	Descriptive - survey (VIII); SoE: Poor Pilot project	Quantitative survey analysis	22 Outpatient follow-up appointments on 19 patients; avg age 40.9 yrs; avg Injury Severity Score=18 Inclusion: 1) age > 13 yrs 2) admission to University of Kentucky Medical Centre (UKMC) after blunt or penetrating trauma 3) discharge from UKMC to county of residence 4) county of residence is one of 11 counties surrounding the Tele-Trauma Clinic in Morehead 5) patient required a routine follow-up appointment with the UK Trauma Surgery service Consent obtained prior to discharge 1 physician performed 20 of the TM consults and 1 physician perfor
2	Bracale M, Cesarelli M, Bifulco P. Telemedicine services for two islands in the Bay of Naples. J of Telemedicine and Telecare 2002; 8: 5-10. **Italy**	To describe a TM program connecting 2 island communities to mainland hospitals, and describe benefits and estimate costs.	Descriptive SoE: Poor	Cost comparison (using estimates) Qualitative costs-consequences analysis	All patients that received a TM consult in 1999 2000

Note: Abbreviations used in this document are described in Appendix D

#	Author / Title / Journal / Year / Country	Purpose/ Objectives	Design	Analysis	Participants: age/ gender/ groups
3	Campbell JD, Harris KD, Hodge R. Introducing telemedicine technology to rural physicians and settings. J of Family Practice 2001; 50(5): 419-424. **USA**	To investigate rural health providers' perceptions of telemedicine, develop a framework for assessing their readiness to adopt the technology, and offer a guide for implementation Evaluating a demonstration project which included - High-speed computer data infrastructure (including computer workstation with E-mail, WWW, medical databases, etc) installed in 10 outpatient practices in 4 communities - V/C facilities located in hospitals in 3 counties and in 1 large group practice clinic.	Non-experimental. Qualitative. Semi-structured interviews with thematic analysis.	Measured how often health providers used TM technology and their perceptions of the advantages, disadvantages, barriers and facilitators involved in adopting it.	N = 57 interviews Physicians = 13 (9M, 4F), avg 52 yrs of age, 19 yrs in rural practice Nurses/Nurse practitioners = 20 (3M, 17F), avg 43 yrs of age, 15 yrs in rural practice Administrative staff = 24 (6M, 18F), avg 45 yrs of age, 14 yrs in administration Participants located in 10 health care practices in 4 communities in 3 rural Missouri counties. Consent given

Note: Abbreviations used in this document are described in Appendix D

#	Author / Title / Journal / Year / Country	Purpose/ Objectives	Design	Analysis	Participants: age/ gender/ groups
4	Capalbo SM, Heggem CH. Evaluating technologies in rural settings. Policy Issues Paper No. 10 1999:1-15. **USA**	Provides overview of TM as a prelude to considering an evaluation framework for TM in rural settings.	Descriptive article. SoE: Poor	Discusses benefit-cost analysis.	n/a

Note: Abbreviations used in this document are described in Appendix D

APPENDIX L: RURAL REMOTE

#	Author / Title / Journal / Year / Country	Purpose/ Objectives	Design	Analysis	Participants: age/ gender/ groups
5	Chua R, Craig J, Wootton R, Patterson V. Cost implications of outpatient teleneurology. J. Telemedicine and Telecare 2001; 7: 62-64. **UK**	To compare the cost of real-time teleneurology with the cost of conventional neurological care	Randomized controlled trial Eligibility: -all consecutive new patients referred by their GP for an outpatient consultation and whose referral letter was graded as non urgent by the consultant neurologist -patients randomized to groups based on the last digit of their hospital number so that each group had roughly equal number of similar symptoms	Some statistical analysis, not detailed	n=168 patients n=82 face to face average age 44 years n=86 TM consultations average age 42 years

Note: Abbreviations used in this document are described in Appendix D

#	Author / Title / Journal / Year / Country	Purpose/ Objectives	Design	Analysis	Participants: age/ gender/ groups
6	Darkins A, Dearden CH, Rocke LG, Martin JB, Sibson L, Wootton R. An evaluation of telemedical support for a minor treatment centre. J Telemedicine and Telecare 1996; 2: 93-99. **UK**	To assess the feasibility and cost benefits of using a TM link to support a nurse practitioner led minor treatment clinic (MTC)	Prospective cohort study. SoE: Fair	Comparison of volume of cases requiring consult Cost comparison (using estimates)	In the 12 mo. before introduction of the TM link (1993/94), 6729 patients were seen in the MTC; 155 (2.3%) referred to local Acute&Emergency dept.; 802 (11.9%) to GP For 2% of cases presenting at MTC, staff required higher skilled support for assessment / management In the first 12 mo. with the TM link (beginning Oct 1994), 9972 patients seen, 147 (1.5%) referred to A&E; 383 (3.8%) to GP. 51 of 9972 (0.5%) patients were seen using the TM link 26F, 25M Mean age 46 yrs; range 1-82

Note: Abbreviations used in this document are described in Appendix D

APPENDIX L: RURAL REMOTE

#	Author / Title / Journal / Year / Country	Purpose/ Objectives	Design	Analysis	Participants: age/ gender/ groups
7	Ferris DG, Macfee MS, Miller JA, Litaker MS, Crawley D, Watson D. The efficacy of telecolposcopy compared with traditional colposcopy. Obstetrics and Gynaecology 2002; 99:248-254. **USA**	To estimate the efficacy or operative quality of telemedicine colposcopy for women in rural health care sites. Consider accuracy of the TC system (TM accuracy), accuracy of the local clinician (clinician accuracy), overall accuracy of the telecolposcopy system as it exists (practical accuracy), and temporal effects of viewing (delayed accuracy)	Case control (VII). SoE: Good-fair All colposcopists were blinded to each others' findings	Measures: examination adequacy, colposcopic impression, biopsy intent, decision to do endocervical curettage, and agreement with biopsy diagnosis. Agreement between colposcopic impressions and cervical histology were assessed by using percent agreement, Cohen's K statistic and McNemar's test with Bonferroni's adjustment.	264 subjects enrolled; mean age=31.7 yrs; range 18-78 yrs Enrolled at 1 of 2 rural sites Inclusions: women >= 18 years of age presenting consecutively for colposcopic evaluation after detection of an abnormal Papanicolaou smear or other specified conditions. Exclusions: severe cervicitis, menses, pregnancy and patient refusal Written consent obtained Clinicians - local colposcopist (FP or NP) - site expert (expert colp'st - rural) - 2 distant experts (expert colp'sts at central TM centre) The same 3 expert colp'sts equally rotated positions as site or distant experts for each session

Note: Abbreviations used in this document are described in Appendix D

#	Author / Title / Journal / Year / Country	Purpose/ Objectives	Design	Analysis	Participants: age/ gender/ groups
8	Guitierrez G. Medicare, the internet, and the future of telemedicine. Crit Care Med 2001; 29(8):144-150. **USA**	Discusses how advances in computer connectivity and communication infrastructure, coupled with Medicare reimbursement for telemedicine services, present medical providers with a unique opportunity to improve healthcare delivery to their patients, in particular those living in rural counties in the United States.	Descriptive article. SoE: Poor	Used peer-reviewed articles and industry-specific surveys published in the internet to reach conclusions.	n/a

#	Author / Title / Journal / Year / Country	Purpose/ Objectives	Design	Analysis	Participants: age/ gender/ groups
9	Hagan L, Morin D, Lepine R. Evaluation of Telenursing outcomes: satisfaction, self-care practices and cost savings. Public Health Nursing 2000: 17(4): 305-313. **Canada**	Report the findings from the first province-wide survey of the Info-Sante Local Community Service Centre (CLSC), a Quebec telenurisng service. Purpose of survey: to determine the "effects its activities have on the population it serves and on the social health network".	Descriptive - survey (VIII); SoE: Poor Used pretested questionnaires and distance-listening quality control procedures.	The Info-Sante CLSC provides the population of Quebec with a first-line response to their physical, psychosocial and mental health needs. Nurses use standardized computerized protocols Measures included aspects of accessibility and quality of the service, and outcomes of the nurses' interventions. Estimated margin of error is only 1.9% for a 4696 call sample	Population studied included all calls received between Oct. 6 and Dec. 15, 1997 Inclusion: - age >= 14 yrs - speak French or English - called for self or other person - called to request information/advice or educational intervention - verbal agreement to possible telephone survey Exclusion - calls re. STDs or conjugal violence Respondents had to be called within 48 - 120 hours of their call to Info-Sante

Note: Abbreviations used in this document are described in Appendix D

#	**Author / Title / Journal / Year / Country**	**Purpose/ Objectives**	**Design**	**Analysis**	**Participants: age/ gender/ groups**
10	Hailey D. Some successes and limitations with telehealth in Canada. J Telemedicine and Telecare 2001; 7(Suppl. 2): S2:73-75. **Canada**	To present impressions gained from the recent literature and contacts with people currently engaged in telehealth activities in Canada	Descriptive - review article. SoE: Poor	n/a	Discusses 8 V/C TM programmes surveyed by Noorani and Picot (2001); 240 - 1224 patients per program; total 2493 patient-related sessions per year and 1812 education sessions per year

Note: Abbreviations used in this document are described in Appendix D

#	Author / Title / Journal / Year / Country	Purpose/ Objectives	Design	Analysis	Participants: age/ gender/ groups
11	Hawker F. Telepsychiatry in South Australia. J. Telemedicine and Telecare 1998; 4:187-194. **Australia**	To review the benefits and limitations of telepsychiatry, as are well as the factors for the success of the project.	Project Review SoE: Poor	Description of a 6 month TM trial that gradually formed into a formal TM unit in the South Australian Rural and Remote Mental Health Service. - used to increase support and access to specialist psychiatric resources, for health care providers, consumers and carers in R&R areas. Psych consults provided by TM facilitate community-based continuity of care for mental health patients, allowing local general practitioners, mental health workers and other health professionals to be more effective in assessment and treatment	n/a

Note: Abbreviations used in this document are described in Appendix D

#	Author / Title / Journal / Year / Country	Purpose/ Objectives	Design	Analysis	Participants: age/ gender/ groups
12	Health Canada (Wong RW). Sharing the learning: the health transition fund. Synthesis series; Rural Health / Telehealth 2002:1-30. **Canada**	Summarizes the key learnings from 33 projects in the rural health/telehealth theme area.	Descriptive article. SoE: Poor	None mentioned	n/a

Note: Abbreviations used in this document are described in Appendix D

#	Author / Title / Journal / Year / Country	Purpose/ Objectives	Design	Analysis	Participants: age/ gender/ groups
13	Hunkeler EM, Meresman JF, Hargreaves WA, Fireman B, Berman WH, Kirsch AJ, Groebe J, Hurt SW, Braden P, Getzell M, Feigenbaum PA, Peng T, Salzer M. Efficacy in nurse telehealth care and peer support in augmenting treatment of depression in primary care. Arch Fam Med 2000; 9:700-708. **USA**	to evaluate the efficacy of 2 augmentations to antidepressant drug treatment.	Randomized control trial. SoE: Good	Means, ANCOVA, logistic regression, Wilcoxon rank sum test, chi squared.	Main reasons for ineligibility included refusing the recruitment interview n=46, requiring referral to other treatment n=30, currently receiving an anti-depressant drug or psychotherapy n=21, refusing the prescribed selective serotonin reuptake inhibitor n=8, and not being literate in English n=8.

#	Author / Title / Journal / Year / Country	Purpose/ Objectives	Design	Analysis	Participants: age/ gender/ groups
14	Jennett PA, Hall WG, Morin JE, Watanabe M. Evaluation of a distance consulting service based on interactive video and integrated computerized technology. J. Telemedicine and Telecare 1995; 1:69-78. **Canada**	Description of a 12 month pilot project.	Descriptive article. SoE: Poor. Interview based.	None mentioned	42 clinical encounters involved 40 patients, two patients used the system twice. N=29 interviews from 28 patients. 50 health care providers accessed the Remote Consultative Network (RCN)
15	Johnson A, Gorman M, Lewis C, Baker F, Coulehan N, Rader J. Interactive videoconferencing improves nutrition intervention in a rural population. J. American Diatetic Association 2001; 101(2):173-174. **USA**	Focuses on two issues: patient satisfaction with the nutrition counseling services and improvement in keeping scheduled appointments through the use of telemedicine.	Non-experimental. Based on results from a baseline survey. SoE: Poor	None mentioned (frequencies?)	Of the appointments scheduled during the time frame (n=5,468) a sample of n=1,688 were randomly selected for phone interviews. There was another sample of 24 patients who had appointments for nutrition services. During the nutrition intervention, dieticians counseled 135 patients for a total of 288 televisits between March 15, 1996 and June 30, 1998.

Note: Abbreviations used in this document are described in Appendix D

#	Author / Title / Journal / Year / Country	Purpose/ Objectives	Design	Analysis	Participants: age/ gender/ groups
16	Lamb A, Eydmann M, Boddy K. Remote maternity. The British Journal of Healthcare Computing & Information Management 1997; 14(7):22-24. **UK**	Discusses ground-breaking work in maternity care networking. Discusses the history and current status of the centre's systems for delivering equitable expertise and improved antenatal care to expectant mothers in their local environments. Remote maternity clinics are the focus.	Descriptive article. SoE: Poor	None mentioned	n/a
17	Liesenfeld B, Renner R, Neese M, Hepp KD. Telemedical care reduces hypoglycaemias and improves glycaemic control in children and adolescents with type 1 diabetes. Diabetes Technology & Therapeutics 2000: 2(4):561-567. Germany	To report on a telemedical program that overcomes geographical isolation of patients on intensive insulin therapy.	Cohort study From May 1, 1997 to May 1, 1999 more than 300 patients with type 1 diabetes enrolled. SoE: Fair	Two-sided non-parametric tests (Wilcoxon) for variables without normal distribution and the two-sided Student's t test for variables with normal distribution. Chi square was used for categorical variables.	Inclusion criteria were age under 26 years and interest in a telecare program on diabetes that would be limited to a period of several months. In the case of small children, cooperation of the caretaker was required. Most patients lived more than 400 km away from the diabetes centre and were treated by local general practitioners or internists. Patients who were not included in the analysis were those who manipulated their data or terminated the program early because of technical or personal reasons.

Note: Abbreviations used in this document are described in Appendix D

#	Author / Title / Journal / Year / Country	Purpose/ Objectives	Design	Analysis	Participants: age/ gender/ groups
18	Minister of Research, Science and Technology of Quebec, Minister of Health and Social Services of Quebec. Telehealth and telemedicine in Quebec: current issues. 1999:1-81. **Canada**	Threefold: a description of the most frequent applications and the principles of videoconferencing and describes the types of programs in place worldwide; examines problems encountered in pilot projects, the organizational, economic and legal issues, and four scenarios in which gains associated with the telehealth deployment are conceivable; presents a conceptual model that focuses on the assessment challenges, and the evolving context of telehealth policies.	Descriptive article. SoE: Poor	n/a	n/a
19	Monrad Aas IH. Changes in the job situation due to telemedicine. J Telemedicine and Telecare 2002; 8: 41-47. **Norway**	To report part of a large study on how TM changes the job situation and how the working environment could be improved for those involved in TM	Qualitative.	Qualitative interview questions: 1) Has the technology produced changes in your job situation? 2) How do the remote consultations fit into your daily work? 3) Is the telemedical equipment easily available? 4) How could the remote consultations be fitted best into your daily work? 5) What would be the ideal number of remote consultations per week for you?	N = 30, median age=46 years, M=70% Includes people working in telepsychiatry (12), teledermatology (6), telepathology frozen-section service (10), tele-otolaryngology (2) - includes specialists, GPs, nurses, lab technicians Sample was obtained by contacting a local hospital where telemedical work was being done and asking for other contact names. This process was continued until the sample was obtained. The 30 respondents worked in 5 northernmost of Norway's 19 counties. Telemedical work was performed for 13 organizations (hospitals, municipalities, health centre, general practice)

Note: Abbreviations used in this document are described in Appendix D

#	Author / Title / Journal / Year / Country	Purpose/ Objectives	Design	Analysis	Participants: age/ gender/ groups
20	Nesbitt TS, Hilty DM, Kuenneth CA, Siefkin A. Development of a telemedicine program: a review of 1000 videoconferencing consultations. West J Med. 2000; 173:169-174. **USA**	To examine the financial and organizational characteristics, demand for services, and satisfaction outcomes of a growing TM program serving both urban or suburban and rural populations	Retrospective review of 1000 consecutive telemedicine consultations in the U of California Davis Telemedicine Program	Rural and urban primary care clinics were compared in several variables using t tests Q'aire had 5 point likert scale for rating satisfaction	657 patients who were seen during the course of 1000 TM consultations -patients were asked by their physician about TM consultations; would they mind having a TM consultation instead of regular care -participation voluntary for patients and physicians
21	Oakely AMM, Kerr P, Duffill M, Rademaker M, Fleischl P, Bradford N, Mills C. Patient cost-benefits of realtime teledermatology- a comparison of data from Northern Ireland and New Zealand. J Telemedicine and Telecare 2000; 6:97-101. **New Zealand**	To assess patient costs and benefits in attending a teledermatology consultation at their local health centre compared with a hospital consultation.	RCT. SoE: Good	Student's t-test, correlation.	109 patients took part in an initial teledermatology consultation and 94 in face-to-face consultation. 203 questionnaires were completed after the first visit and a further 20 on subsequent visits.

Note: Abbreviations used in this document are described in Appendix D

#	Author / Title / Journal / Year / Country	Purpose/ Objectives	Design	Analysis	Participants: age/ gender/ groups
22	O'Neill SK, Denton GL, Brockway PD, Davidson M, Wallsten D. Demonstration of the usefulness of telehealth in providing enhanced primary health services to the northern, geographically remote communities of Trout Lake, Peerless Lake and Red Earth Creek, Alberta. Keeweetinok Lakes Regional Health Authority no. 15.:4-45. **Canada**	To demonstrate the usefulness of Telehealth in facilitating enhanced primary health services to the northern, geographically remote communities of Trout Lake, Peerless Lake and Red Earth Creek. Goals: telehealth will improve the overall health delivery system within the region; telehealth will provide improved access to health services and provides more equitable services; telehealth will enhance health education/promotion programs; telehealth will assist in reducing travel and associated costs for the patient, his/her family, and staff.	Non-experimental. SoE: Poor	Session logs were used, telehealth evaluation logs were used.	The communities of Trout Lake, Peerless Lake and Red Earth Creek.

Note: Abbreviations used in this document are described in Appendix D

#	Author / Title / Journal / Year / Country	Purpose/ Objectives	Design	Analysis	Participants: age/ gender/ groups
23	Piette JD, Weinberger M, McPhee SJ. The effect of automated calls with telephone nurse follow-up on patient-centered outcomes of diabetes care. Med Care 2000; 38:218-230. **USA**	To evaluate the impact of automated telephone disease management (ATDM) calls with telephone nurse follow-up as a strategy for improving outcomes such as mental health, self-efficacy, satisfaction with care, and health-related quality of life among low-income patients with diabetes mellitus.	RCT SoE: Good	Assessed the success of randomization by using t-tests and chi squared tests. General analytic strategy was ANCOVA	Participants were enrolled from 2 general medicine clinics of a county health care system serving a multilingual population of patients who typically are poor and have inadequate health insurance. Excluded patients included those who were older than 75, had a diagnosed psychotic disorder, disabling sensory impairment, or life expectancy of less than 12 months, or whose primary language was neither English nor Spanish. For Spanish, they identified using a primary scale.

Note: Abbreviations used in this document are described in Appendix D

APPENDIX L: RURAL REMOTE

#	Author / Title / Journal / Year / Country	Purpose/ Objectives	Design	Analysis	Participants: age/ gender/ groups
24	Rogers Mary AM, Small D, Buchan DA, Butch CA, Stewart CM, Krenzer BE, Husovsky. Home monitoring service improves mean arterial pressure in patients with essential hypertension. Ann Intern Med 2001; 134:1024-1032. **USA**	To determine the efficacy of a telecommunication service in reducing blood pressure.	RCT SoE: Good	t-tests; chi-squared used for hypothesis testing of categorical data; Mann-Whitney U test; ANCOVA.	Eligible patients were those who had previously received diagnosis of essential hypertension an were under evaluation for a change in anti-hypertensive therapy because of elevated blood pressure, undesirable side effects of current hypertensive medication. Patients who were younger than 18, were pregnant, had secondary hypertension or did not have the mental capacity to monitor blood pressure at home were excluded.
25	Schopp LH, Johnstone BR, Merveille OC. Multidimensional telecare strategies for rural residents with brain injury. J Telemedicine and Telecare 2000; 6(1):146-149. **USA**	Three purposed: to evaluate the efficacy of videoconferencing for neuropsychological assessment, and to evaluate the extent to which persons with brain injury could use videoconferencing; to evaluate the experiences of persons in a rural rehabilitation inpatient unit who received videoconferencing psychotherapy for emotional and behavioural adjustment issues related to brain injury; to examine the efficacy of videoconferencing to enhance the skills of rural mental health providers, who formed a resource network for persons with brain injury.	Non-randomized controlled prospective study. SoE: Fair	Frequencies and proportions.	The 52 intervention participants were referred by the state Division of Vocational Rehabilitation. 52 matched controls (age and diagnosis match). Patients were assigned to groups on the basis of next available appointment. All participants had cognitive dysfunction associated with traumatic brain injury, learning disabilities, multiple sclerosis or other disabilities.

Note: Abbreviations used in this document are described in Appendix D

APPENDIX L: RURAL REMOTE

#	Author / Title / Journal / Year / Country	Purpose/ Objectives	Design	Analysis	Participants: age/ gender/ groups
26	Simpson J, Doze S, Urness D, Hailey D, Jacobs P. Telepsychiatry as a routine service- the perspective of the patient. J Telemedicine and Telecare 2001; 7:155-160. **Canada**	To evaluate the perceptions of patients in the context of a routine telepsychiatry service in central Alberta. The results from the assessment which relate to the overall use of telepsychiatry and the effect on other health services are discussed in a separate publication.	Surveys and telephone interviews. SoE: Poor	Not mentioned	379 questionnaires were distributed to patients; 230 were returned.
27	Smith AC, Isles A, McCrossin R, Van der Westhuyzen J, Williams M, Woollett H, Wooten R. The point-of-referral barrier - a factor in the success of telehealth. J Telemedicine and Telecare 2001; 7(2):75-78. **Australia**	To discuss the results of a feasibility study that tested the hypothesis that for an effective telehealth service, a full-time coordinator is required to act as a single point of contact for consultation requests.	Non-experimental. SoE: Poor	None mentioned	None

Note: Abbreviations used in this document are described in Appendix D

#	Author / Title / Journal / Year / Country	Purpose/ Objectives	Design	Analysis	Participants: age/ gender/ groups
28	Stiles N, Boosalis M, Thompson K, Stinnett D, Rayens MK. Nutrition telemedicine consultation for rural elders. J Nutrition for the Elderly 1998; 18(1):47-55. **USA**	Description of a pilot telemedicine nutritional consultation service to determine the feasibility of using this technology for nutritional assessment.	Non-experimental pilot study. SoE: Poor	none mentioned	20 elderly individuals. Inclusion criteria was: they had to be at least 65 years of age, actively followed in one of the four rural clinics sponsored by St. Claire Medical Centre, and if they carried a diagnosis of diabetes or hypertension. The eligible patients were identified from clinic rosters using ICD-9 codes for hypertension and diabetes mellitus.

Note: Abbreviations used in this document are described in Appendix D

#	Author / Title / Journal / Year / Country	Purpose/ Objectives	Design	Analysis	Participants: age/ gender/ groups
29	Swanson B. Information technology and under-served communities. J Telemedicine and Telecare 1999; 5(2):3-10. **Australia**	Discusses various implications and downfalls of telecommunications and telemedicine. Also discusses two case studies of telemedicine projects.	Descriptive article. SoE: Poor	None	Looks at two case studies

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APPENDIX L: RURAL REMOTE

#	Author / Title / Journal / Year / Country	Purpose/ Objectives	Design	Analysis	Participants: age/ gender/ groups
30	Tsilimigaki A, Maraka S, Tsekoura T, Agelakou V, Vekiou A, Paphitis C, Thanopoulos V. Eighteen months experience with remote diagnosis, management and education in congenital heart disease. J Telemedicine and Telecare 2001; 7:239-243. **Greece**	The telemedicine project described aimed to improve patient care by providing real-time medical consultation and follow-up by medical experts. This preliminary communication reports the initial experience with telemedicine for remote diagnosis, management and education in congenital heart disease.	Descriptive article. SoE: Poor	None mentioned	18 month study from July 1998 to December 1999. 39 teleconsultations were carried out. 93 children were evaluated by telemedicine. N=54 boys and n=39 girls.
31	Tually P, Parrish F, and Walker J. Nuclear medicine teleradiology in regional and rural centres of Western Australia. J Telemedicine and Telecare, 1999; 5:47-50. **Australia**	Authors have established a nuclear medicine teleradiology service for rural and regional areas of south-west Western Australia. This study aimed to evaluate whether existing treatment models had altered in way which were directly related to improved medical outcomes and reduced cost.	Quasi-experimental design to compare non-equivalent control groups in rural centres with access to the service, against a demographically similar community with no access. SoE: Fair	Collection of data arises from patient q'aires, content analysis of documents, compilation of plain-film negative/bone-scan positive studies and ratings by local medical practitioners. A cost benefit analysis of tangible variables will be calculated retrospectively.	After 6 months there were 65 subjects from Mandurah and Banbury with radio-occult osseous disease of the foot and ankle. There were 42 females and 23 males whose ages ranged from 16 to 67 years

Note: Abbreviations used in this document are described in Appendix D

#	Author / Title / Journal / Year / Country	Purpose/ Objectives	Design	Analysis	Participants: age/ gender/ groups
32	Tually P, Walker J, Cowell S. The effect of nuclear medicine telediagnosis on diagnostic pathways and management in rural and remote regions of Western Australia. J Telemedicine and Telecare, 2001, 7: 50-53. **Australia**	Data collected over three years were examined to determine the clinical effect of nuclear medicine teleradiology (NMT) and its effect on diagnostic patterns for the investigation of cardiovascular disease, radio-occult musculoskeletal injury, and oncology	Quasi-experimental design; compared groups with access to the service against a similar demographic community without access. Qualitative and quantitative approach based on case study analysis, Medicare billing data and q'aires. SoE: Fair	To illustrate change, the performance indicator was considered to be a shift in referral trends towards the best CPG. Specific clinical indications were: -trauma -oncology -cardiology	Medical practitioners from pre-NMT and non-NMT regions were surveyed in order to identify which diagnostic and management paradigms they nominated for specific clinical scenarios, and 3 years after the NMT services began, the surveys were repeated. n=209 practitioners were surveyed 133 pre-NMT and post-NMT respondents, a response rate of 77% and 82% respectively and 50 metropolitan and 26 non-NMT practitioners were also compared with a response rate of 77% and 82%
33	Vassallo DJ, Hoque F, Farquharson Roberts M, Patterson V, Swinfen P, Swinfen R. An evaluation of the first year's experience with a low-cost telemedicine link in Bangladesh. J Telemedicine and Telecare 2001; 7:125-138. **Bangladesh**	To discuss an evaluation done on a telemedicine project between the UK and Bangladesh.	Non-experimental. Evaluation of telemedicine referrals. SoE: Poor	At the end of the study period the email traffic was analyzed to determine the specialties involved, speed of initial reply, time to completion of each consultation, number of e-mail messages for each referral, number of images and size of files, and the frequency of referrals.	None

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#	Author / Title / Journal / Year / Country	Purpose/ Objectives	Design	Analysis	Participants: age/ gender/ groups
34	Watanabe M, Jennett P, and Watson M The effect of information technology on the physician workforce and health care in isolated communities: the Canadian picture. J Telemedicine and Telecare, 1999. 5:11-19. **Canada**	This article looks at how the information highway can/would/ will impact the Canadian health care system and improve the quality of life of its citizens as well as foster economic development and jobs	Review article. SoE: Poor	None	None
35	Woods KF, Johnson JA, Kutlar A, Daitch L, Stachura ME. Sickle cell disease telemedicine network for rural outreach. J Telemedicine and Telecare 2000; 6:285-290. **USA**	Description of a telemedicine project. The project was based on the following hypothesis; that disease-based telemedicine clinics are feasible and will result in improved health-care access and utilization patterns for SCD (sickle cell disease) patients in Georgia; that telemedicine encounters will be acceptable to the SCD population in Georgia; and that a SCD telemedicine network will enhance the outreach efforts of the MCG sickle cell center.	Descriptive article. SoE: Poor	Differences between groups were evaluated using t-tests.	During the 36 month study period, there were 77 SCD telemedicine clinics and 466 patient encounters at three clinical sites. Encounters were distributed among 128 SCD patients residing in 44 counties across middle and southern Georgia. Mean age of the patients was 27 yrs.

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APPENDIX L: RURAL REMOTE

#	Author / Title / Journal / Year / Country	Intervention/ Duration	Follow-up: sample size; dropout	Outcomes/ Socio-Economic Indicators
1	Boulanger B, Kearney P, Ochoa J, Tsuei B, Sands F. Telemedicine: a solution to the follow-up of rural trauma patients? J Am Coll Surg 2001: 447-452. **USA** Kentucky	Any necessary imaging studies performed just before the clinic appointment Patient interviewed via V/C by examining physician. TeleTrauma Clinic nurse available to assist in patient exam. - 20 encounters used electronic stethoscope - 14 used close-up imaging instrument to view injuries and surgical incisions - 13 encounters - x-rays viewed Average and median duration of appointments was 14 min., range 3 - 25 min. After the teleappointment both the patient and examining physician were asked to complete surveys.	2 eligible patients refused to participate and had their clinical follow-up at the UKMC	Patient surveys indicate a high degree of satisfaction. 2/19 patients said they would have preferred to see the consultant in person rather than by TM. Some respondents indicated that they would not have travelled to UKMC for follow-up. Travel distance and time for patients were significantly less than if these patients had traveled to UKMC for their appointment. Examining physicians rated both radiograph resolution and the confidence in their judgment of the radiograph as high 3 cases referred for further TM follow-up; 4 cases referred for ftf follow-up
2	Bracale M, Cesarelli M, Bifulco P. Telemedicine services for two islands in the Bay of Naples. J of Telemedicine and Telecare 2002; 8: 5-10. **Italy**	Equipment included V/C, document camera, interactive whiteboard, digital scanners for teleradiology, digital ECG transmission In 1999-2000, from Procida there was an average of 46 TM consultations per year (60% radiology, 30% cardiology, 10% other), 35% of which were emergencies, and 16 training sessions per year From Ischia, avg 28 TM consultations per year (80% radiology, 10% cardiology, 10% other), 10% emergencies; 12 training sessions per year. Avg duration of TM consultation 15 min.	n/a	Total fixed cost of the TM system between the 2 islands and the 2 mainland hospitals was ~ 48,000/year; total variable costs: ~ 750/year. Total savings due to TM ~ 40,000/year. Positive consequences of the TM service included more rapid dx and tx, improved quality of service, and transfer of skills & education.

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APPENDIX L: RURAL REMOTE

#	Author / Title / Journal / Year / Country	Intervention/ Duration	Follow-up: sample size; dropout	Outcomes/ Socio-Economic Indicators
3	Campbell JD, Harris KD, Hodge R. Introducing telemedicine technology to rural physicians and settings. J of Family Practice 2001; 50(5): 419-424. **USA**	57 interviews Study staff transcribed the interviews verbatim and entered them into a computer database program, Ethnograph Coding scheme and salient themes were reviewed independently by a panel of information specialists and health care providers form nursing and medicine who were familiar with the demonstration project.	not reported	Rural health care providers vary in their perceptions and use of TM. Providers in practices affiliated with the university's tertiary center were more likely to use TM than in private practice. Identified 6 themes related to rural providers' receptivity to technological change: turf, efficacy, practice context, apprehension, time to learn, ownership. A classification scheme is provided describing a rural practice's readiness to change & the associated strategies for implementing new technologies in each category. Re. turf: some rural providers perceive TM as a threat to their livelihood or professional autonomy or both Practice context: the pace of technological change in rural areas tends to be slower, and apprehension, technophobia, and concern about reliability of information obtained through telehealth exists.

#	Author / Title / Journal / Year / Country	Intervention/ Duration	Follow-up: sample size; dropout	Outcomes/ Socio-Economic Indicators
4	Capalbo SM, Heggem CH. Evaluating technologies in rural settings. Policy Issues Paper No. 10 1999:1-15. **USA**	Overview of telemedicine technologies as a prerequisite for the design of a framework for evaluating the impacts of telemedicine technologies in rural settings. Introduces an economic framework, focusing on issues that need to be addressed in quantifying the benefits of telemedicine to rural communities. An observable characteristic of change in the underlying structure of rural health care has been the increase in rural hospital closure.	none	Observable characteristics of change in the underlying structure of rural health care is the increase in rural hospital closures. Because of this, different health care for rural citizens than in years past. Result is more widespread use of telemedicine. Telemedicine impacts rural health care in several ways: it impacts the kinds of services that can be offered in rural communities, it impacts the quality of the services, and it impacts the cost of providing or supplying a given level of health care services to a community. Also suggests that the total social benefit of telemedicine implementation may potentially be greater than the social costs involved, the incentive for physicians may be such that they largely forgo involvement in telemedicine altogether.

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#	Author / Title / Journal / Year / Country	Intervention/ Duration	Follow-up: sample size; dropout	Outcomes/ Socio-Economic Indicators
5	Chua R, Craig J, Wootton R, Patterson V. Cost implications of outpatient teleneurology. J. Telemedicine and Telecare 2001; 7: 62-64. **UK**	Duration of face to face and TM consultations not reported	n=65 seen face to face n=76 seen by TM rest of participants did not keep their appointments	All outcome measures were better in the face to face group -significant difference in the process is that there were more investigations in the TM group -TM was 46% more expensive than conventional consultation and did not appear to be cost efficient

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#	Author / Title / Journal / Year / Country	Intervention/ Duration	Follow-up: sample size; dropout	Outcomes/ Socio-Economic Indicators
6	Darkins A, Dearden CH, Rocke LG, Martin JB, Sibson L, Wootton R. An evaluation of telemedical support for a minor treatment centre. J Telemedicine and Telecare 1996; 2: 93-99. **UK**	When consult required, MTC staff and patient linked by V/C to A&E consultant in Belfast Access to consultant took < 2 min. on all occasions except 1		# of teleconsultations was less than expected: 0.5% vs. 2.0% predicted. Of 51 cases consulted over TM link, MTC completed tx of 20 patients; 13 referred to GP; 11 referred to A&E; 6 referred to other; 1 followed up at MTC Picture quality good-fair in 94% of cases; adequate for providing advice in 94% cases. There was concern re. deskilling of nurses, making them dependent on MD consultants - but there was no evidence of this. Total cost of the TM link was 7250 per annum, vs. alternative of 50,000 per annum to employ medical staff on-site. Change in referral pattern: fewer patients referred to A&E and to GP after implementation of TM link -- suggests increase in autonomy of practice shown by the nurse practitioners

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7	Ferris DG, Macfee MS, Miller JA, Litaker MS, Crawley D, Watson D. The efficacy of telecolposcopy compared with traditional colposcopy. Obstetrics and Gynaecology 2002; 99:248-254. **USA**	Site expert conducted comprehensive colposcopic exam, recorded findings and anticipated management but did not collect specimen. Then local colp'st conducted complete colp'c exam, with distant expert observing and available for consult. - used interactive color video and audio TC with biomedical telemetry All visits recorded on video. The other distant expert examined videotape at a later date.	Number of subjects approached: not stated. TM technical difficulties (for one colposcopic session) excluded participation by some eligible subjects	Site experts recommended significantly lower % of cervical biopsy (57.6%) and ECC (59.0%) compared with the other colposcopists (P<.001). Local colp'sts consulted with distant experts during 36.2% of colp'c exams. Telecolposcopy diagnostic accuracy of distant experts was similar to that of onsite experts. Re. colp'c exam adequacy, clinical agreement (82.2%, K=.51) was significantly better than TM and practical agree't. Need for cervical biopsy: practical agree't sign. greater than TM or clinician agree't Need for ECC: TM agree't (69.1%, K=34) < clinician agree't (74.5%, K=.45) < practical agree't (86.9%, K=.65). Colp'c dx: TM agree't (52%) sign. less than clinician agree't (65.6%) and practical agree't (61.7%) Diagnostic agree't was best for the local colp'sts (59.7%).

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8	Guitierrez G. Medicare, the internet, and the future of telemedicine. Crit Care Med 2001; 29(8):144-150. **USA**	Discusses history of computer use and internet use. History of telemedicine. Addresses policy issue of reimbursement of telemedicine services.	none	Medicare reimbursement will transform telemedicine from an interesting, but economically languishing technology, into a multimillion-dollar business. Moreover, payments by private insurance plans and health maintenance organizations are sure to follow Medicare's lead. Beginning October 1, 2001, the comprehensive character of BIPA 2000 will extend Medicare coverage to a wide range of services and providers, from medical telesessions to mental health and pharmacologic monitoring. Most likely scenario for the expansion of telemedicine services to rural counties will be through networks using internet technology.

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APPENDIX L: RURAL REMOTE

#	Author / Title / Journal / Year / Country	Intervention/ Duration	Follow-up: sample size; dropout	Outcomes/ Socio-Economic Indicators
9	Hagan L, Morin D, Lepine R. Evaluation of Telenursing outcomes: satisfaction, self-care practices and cost savings. Public Health Nursing 2000: 17(4): 305-313. **Canada**	Original sample: 65 CLSC sites in 15 regional health authorities / total 128 eligible CLSC sites 4705 of 5578 calls completed; final n=4696 Respondents' mean age 35.6; F=84.9%	6 selected CLSC sites could not participate; i.e., 59 out of 65 selected sites participated 4705/5579 calls corresponds to response rate of 89.6% and refusal rate of 2.6%. 9 interviews conducted > 120 hrs post call were eliminated Final sample 4696 respondents	Patients were very satisfied with the perceived quality of the service (i.e., understanding of the problem, clarity of advice, suitability of suggested solutions, courtesy, etc.) 95% said the call was useful in solving their problem; 2/3 very useful 92.7% said they would use the service again If the service had not been available, 50% said they would have gone to an Emergency Dept; 1/3 would have gone to a medical clinic 80% said using the service saved them avg 5 hrs of their time; 1/3 said they saved avg 3 hrs child care costs Other savings: transportation and time lost on the job

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#	Author / Title / Journal / Year / Country	Intervention/ Duration	Follow-up: sample size; dropout	Outcomes/ Socio-Economic Indicators
10	Hailey D. Some successes and limitations with telehealth in Canada. J Telemedicine and Telecare 2001; 7(Suppl. 2): S2:73-75. **Canada**	n/a	none	Among 8 Canadian programmes, V/C has had an effect on - use of ftf assessments, - timing of care, - certainty of dx, - patient acceptance, - comfort level, - long-distance travel. In Alberta, telepsychiatry has been shown to be a sustainable service that has improved access to mental health services for persons living in small communities, at a realistic cost Teleultrasound in AB was helpful to the referring physician, made transfer unnecessary for 42% of patients and influenced management in 59% Another tele-u/s project in AB was acceptable to clients and reduced no-show rate, but was not CE Controlled study of telephone support for rural carer groups in a brain injury programme in AB demonstrated improved outcomes and reduced cost for the telephone support grp.

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11	Hawker F. Telepsychiatry in South Australia. J. Telemedicine and Telecare 1998; 4:187-194. **Australia**	Telepsychiatry services for emergent / semi-emergent consultations, inpatient liaison, and post-discharge (out patient) follow-up	none	Telemedicine has been used by the Mental Health Service in three main ways: for clinical purposes, for educational services and for administration. Three primary issues and concerns of rural health workers were identified: telepsychiatry was not viewed as a viable option; it was feared that visiting of psychiatrists would cease; and it was feared that local healthcare professionals would become devalued and deskilled. The service however lacks the policies relating to patient consent for telepsychiatry, policies that seem to be common in other telepsychiatry services.

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12	Health Canada (Wong RW). Sharing the learning: the health transition fund. Synthesis series; Rural Health / Telehealth 2002:I-30. **Canada**	No specific intervention. Summary of 33 projects.	none.	Telehealth helped reduce the need for patients to travel long distances in order to seek medical care. These generally favourable results were often achieved at substantial costs. Most of the HTF telehealth-related projects reported user satisfaction. Some projects successfully used telehealth for patient education and to bring continuing education programs to rural-based practitioners. The effectiveness of telehealth and its acceptance by both practitioners and users have been demonstrated in many studies both in Canada and abroad. The geographic and demographic characteristics of a community often have a bearing on its economic activities and social relationships, which in turn, may have an impact on lifestyle, health behaviours, attitudes towards health, and indirectly, on health status.

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13	Hunkeler EM, Meresman JF, Hargreaves WA, Fireman B, Berman WH, Kirsch AJ, Groebe J, Hurt SW, Braden P, Getzell M, Feigenbaum PA, Peng T, Salzer M. Efficacy in nurse telehealth care and peer support in augmenting treatment of depression in primary care. Arch Fam Med 2000; 9:700-708. **USA**	There were three groups; usual physician care, usual physician care plus nurse telehealth care, or usual physician care plus nurse telehealth care plus peer support. Nurse telehealth consisted of 1 to 2 telephone calls per week during the first 2 weeks of reenrollment, 1 call per week during weeks 3 to 8, then 1 call every 2 weeks up to week 16. The nurse offered emotional support and offered suggestions about how to deal with medication side effect. Peer support was provided by health plan members who had experienced a successfully treated episode of major depression or dysrhythmia and who volunteered to be trained as peer supporters. Training lasted approximately 20 hours and consisted of lectures, role play, and discussion. Peer were linked with study patients of similar age and sex who had been assigned to the peer support condition.	486 patients were referred to the study. N=116 who were ineligible; n=68 who refused to give informed consent. N=302 who were enrolled. Of these, n=271 who were interviewed at 6 weeks and n=256 who were interviewed at 6 months.	The hypothesis that nurse telecare was superior to usual physician care with respect to reduced symptoms, improved functioning and greater satisfaction with care for depression was confirmed. 50% of the patients receiving nurse telecare received a 50% reduction in the Beck depression scale score at 6 weeks compared to 37% reduction in those receiving usual physician care. Satisfaction with care showed a robust incremental effect for nurse telehealth care. Medication adherence does not improve with nurse telehealth care. At 6 weeks, 73% of usual care and 80% of telehealth patients were taking an antidepressant medication. At 6 months, 54% of usual and 56% of telehealth were taking an antidepressant medication. No significant additive effect of peer support.

#	Author / Title / Journal / Year / Country	Intervention/ Duration	Follow-up: sample size; dropout	Outcomes/ Socio-Economic Indicators
14	Jennett PA, Hall WG, Morin JE, Watanabe M. Evaluation of a distance consulting service based on interactive video and integrated computerized technology. J. Telemedicine and Telecare 1995; 1:69-78. **Canada**	The evaluation of the RCN included the following objectives: to determine whether or not the RCN affected access to health care for rural patients; diagnostic, investigative and management decisions; patient and physician travel times; feelings of professional isolation and educational opportunities; the overall health of the patient. Interviews were conducted with system users, patients, referring and consulting physicians, registered nurses and other system users such as technicians, educational coordinators and emergency paramedical staff. Patients were asked to report their satisfaction with , and the consequences of, the RCN.	patients from 7 small communities and the city of Drumheller participated. 75 encounters were attempted and 55 were actually completed. Of the 12 patients not interviewed, three had a mental illness other than dementia, two were demented, two died before they could be interviewed, two had incorrect addresses and could not be located, one was admitted to drug rehabilitation program, one was admitted to a home for runaway children, and one moved out of province.	There was a strong agreement by almost all of the health care providers interviewed about the positive impact of the system on the patients, their families and support systems in the rural community. Timeliness and convenience were clearly identified by all eight referring physicians as the primary impact of telemedicine on their community. In all 29 interviews, patients identified reduced travel time, and in 10 they identified convenience as major benefits. There was a general recognition that, while certain diagnostic and investigative activities were not possible, the majority of clinical consultations could be undertaken.
15	Johnson A, Gorman M, Lewis C, Baker F, Coulehan N, Rader J. Interactive videoconferencing improves nutrition intervention in a rural population. J. American Diatetic Association 2001; 101(2):173-174. **USA**	The dieticians used the group system units in conference rooms at the hub hospital. Patients used desktop units located in provider offices or in multipurpose rooms at the regional clinics. Dieticians blocked out four two-hour periods each week for "televisits" which were advertised to the participating clinics.	There was a post-intervention interview.	74% of the conventional visits were kept, while only 79% of the televisits were kept. The dieticians felt that they reached patients through televisits who may have been lost to counseling otherwise. In the post-intervention interview, 99% felt that reduced travel time was a benefit.

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16	Lamb A, Eydmann M, Boddy K. Remote maternity. The British Journal of Healthcare Computing & Information Management 1997; 14(7):22-24. **UK**	Service was initially based on consultant-led outreach antenatal clinics with care plans and risk cards; major effort was to support the care process in the local community. New telemedicine technologies were introduced to try to further support the care activities by reducing hospital attendance rates, improving team approaches to care and reducing the requirement for the patient and hospital specialist to travel. Electronic remote-database access to patient and service related information, fetal-maternal monitoring and ultrasound scanning were introduced into the community.	none	Reduced need for women to travel to the hospital. Been of particular benefit to high-risk patients, and has greatly reduced the number of women requiring referral to the specialist unit whilst also reducing the number of carers seen.
17	Liesenfeld B, Renner R, Neese M, Hepp KD. Telemedical care reduces hypoglycaemias and improves glycaemic control in children and adolescents with type 1 diabetes. Diabetes Technology & Therapeutics 2000: 2(4):561-567. Germany	All patients were provided with an identical hand-held glucose meter with memory storage and a palmtop computer with integrated analog modem. Patients were advised to measure blood glucose at least four times daily, to document insulin doses, meals, and exercise in the glucose meter, and to transfer the data the modem computer of the palmtop computer to a remote computer in the diabetes centre at least once a week. Ordinary telephone lines were sufficient to transmit the data. A diabetologist viewed the data, and at the start of the program initiated the telephone counseling with the patient or caretaker to discuss the individual treatment goals for a 3-month period. Treatment was stopped when treatment goals were met or when no further progress could be obtained.	n=54 in the final analysis.	HbA1c had dropped by 0.4% at the end of the program. Authors feel that the program safely and effectively improved metabolic control in children and adolescents with type 1 diabetes while reducing the number of hypoglycemic events. Found that the variability of blood glucose to be an independent predictor of hypoglycemic events at entry into the program. This variability was significantly reduced by the intervention.

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APPENDIX L: RURAL REMOTE

#	Author / Title / Journal / Year / Country	Intervention/ Duration	Follow-up: sample size; dropout	Outcomes/ Socio-Economic Indicators
18	Minister of Research, Science and Technology of Quebec, Minister of Health and Social Services of Quebec. Telehealth and telemedicine in Quebec: current issues. 1999:1-81. **Canada**	n/a	n/a	Problems with telehealth implementation are the user-unfriendliness of the technology, the uncertain institutional context as regards its use by physicians, and the difficulty ascertaining its value added. The legal implications of the use of telemedicine stem from the obligations and responsibilities that shape the relationship between the attending physician, consulting physician, patient and hospital. If the legal and organizational issues are not resolved, it is unlikely that optimal use will be made of telehealth.
19	Monrad Aas IH. Changes in the job situation due to telemedicine. J Telemedicine and Telecare 2002; 8: 41-47. **Norway**	30 interviews Data collected from Sept 1998 - Apr 1999 Interviews tape recorded and transcribed	2 of 32 persons contacted refused to be interviewed due to lack of time, giving a response rate of 94%	Positive aspects of working with TM included: - less travelling to see patients or attend meetings, which gave more time for other work (productivity improved), - less need to travel in poor weather, - new contacts, - increased sense of professional security (because support was readily available), - satisfaction of seeing partners in communication Desire to have TM equipment in own office for convenience. TM work can be tiring (e.g., require continuous attention to a screen). Desire to limit the number of hours of TM-related work per week. Doubtful that full-time TM work would be desirable. No important age- or gender-related differences in answers were identified.

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20	Nesbitt TS, Hilty DM, Kuenneth CA, Siefkin A. Development of a telemedicine program: a review of 1000 videoconferencing consultations. West J Med. 2000; 173:169-174. **USA**	1000 telemedicine consultations Times varied by appointment ie.initial evaluations could take 60 minutes and follow up appointments were about 30 minutes	657 patients were seen during the course of the 1000 MC consultations, but 51 patients were excluded in some instances due to the fact they were seen in correctional facilities	Rural TM patients had a larger proportion of paediatric patients than urban or suburban group TM consultations were provided in 19 specialty areas, most common were nutrition, dermatology, and behavioural health -Patient satisfaction data collected on 362 of 1000 consultations and interview based specialties like endocrinology were more highly rated by patients than those involving the use of scopes or cameras -Physicians also rated TM consultations highly -there are differences in demand for specialty services between rural and suburban sites with rural sites having a higher demand overall and in the breadth of specialties -Primary health care providers derive an educational benefit from collaborating with a physician
21	Oakely AMM, Kerr P, Duffill M, Rademaker M, Fleischl P, Bradford N, Mills C. Patient cost-benefits of realtime teledermatology- a comparison of data from Northern Ireland and New Zealand. J Telemedicine and Telecare 2000; 6:97-101. **New Zealand**	Interactive teledermatology consultations were conducted at the patient's own health centre by videoconference to the department of dermatology. Patients randomized to a hospital consultation were seen by the dermatologist in the outpatient department, sooner than was the case for non-trail patients. After the consultation, patients were asked to complete a similar economic questionnaire to that used in the UK study. Twenty patients were asked to complete the questionnaire again on follow-up. The dermatologists completed a report which was then sent to the patient's GP by e-mail.	n=203	The study showed differences between the time recorded for the consultation by the patient and that recorded by the dermatologist in 127 cases, with differences ranging from -20 to +80 min. Some of the patients recorded the approximate cost of incidental expenses such as parking, child care, meals and payment to an employee. The study confirms the assertion that teledermatology consultations are less time-consuming for patients than hospital consultations. On average, the patients waited twice as long to see a dermatologist at the hospital as at the health centre. The patients' estimates of the distances traveled to and from hospital consultations were considerably higher than those of patients attending their own health centre.

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22	O'Neill SK, Denton GL, Brockway PD, Davidson M, Wallsten D. Demonstration of the usefulness of telehealth in providing enhanced primary health services to the northern, geographically remote communities of Trout Lake, Peerless Lake and Red Earth Creek, Alberta. Keeweetinok Lakes Regional Health Authority no. 15.:4-45. **Canada**	Performed a needs assessment. Came up with a "short list" of health services that could be delivered via telehealth. Needed staff buy-in. Also needed community buy-in. Demonstrated that telehealth systems could be used not just to deliver health services, but to facilitate community consultation about community need and health service planning. Had to demonstrate the effectiveness of the technology in client/practitioner interaction. Speech therapy was received; nutritional educational session; lactation education session; education to the remote staff was also given. Most of the clinical consultations were for speech therapy.	not mentioned	Overall, not enough client and provider satisfaction data was not collected to be useful. Utilization data analyzed. Telehealth usage was 417.17 hours over 17 months with an average usage rate of 24.5 hours per month. Purpose of session changed as the telehealth system matured. Clinical consultations, physician consultations, education sessions and teleultrasound together account for 87% of the telehealth system usage in the year 2000. 63% of the staff rated the telehealth system as very good or good.

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23	Piette JD, Weinberger M, McPhee SJ. The effect of automated calls with telephone nurse follow-up on patient-centered outcomes of diabetes care. Med Care 2000; 38:218-230. **USA**	ATDM calls consisted of hierarchically structured messages composed of statements and queries recorded in a human voice. All calls were placed at times that the patient indicated were convenient. Calls lasted 5-8 minutes. Intervention patients interacted with the ATDM computer by using the push-button keypad on their telephone. Push-button responses were stored automatically and determined the subsequent course of the message. Each assessment also included questions about intervention patient's perceptions of their glycemic control; symptoms of poor control, foot problems, chest pain, and breathing problems; and self-care issues related to SMBG and foot care. During each assessment, intervention patients were given the option to listen to randomly cycling diabetes "health tips".	588 patients were identified as potentially eligible. N=46 were excluded at request of doctor, n=148 who declined to participate, n=114 who were not enrolled for some other reason. N=280 who were enrolled. N=248 patients at the end of 12 months that data was collected from.	Compared with patients receiving usual care, patients in the intervention group at follow-up reported fewer symptoms of depression. Intervention patients also reported greater self-efficacy to perform self-care activities than patients receiving usual care. Patients who had received the intervention had better glycemic control and fewer diabetic symptoms than patients receiving usual care.

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24	Rogers Mary AM, Small D, Buchan DA, Butch CA, Stewart CM, Krenzer BE, Husovsky. Home monitoring service improves mean arterial pressure in patients with essential hypertension. Ann Intern Med 2001; 134:1024-1032. **USA**	The intervention was a telecommunication service consisting of three components: automatic blood pressure recording at home, central processing and electronic reports provided weekly to the primary physician and patient. Patients were instructed to take their blood pressure three times in the morning before eating and drinking and three times in the evening before going to bed. Patients assigned to usual care were treated for hypertension according to the guidelines of the Joint National Committee on Prevention, Detection, and Treatment of High Blood Pressure.	167 patients were identified as possible candidates. N=121 were found to be eligible. Of those receiving intervention, 93% completed the trial, and 90% of usual care completed the trial.	There were statistically significant differences between the home service and usual care groups when changes in pressure from baseline to exit were compared. Statistically significant difference were seen for mean diastolic pressure. The decrease in blood pressure was evident for both men and women. Patients were generally satisfied with their care. Blood pressure decreased in patients who used the service while hypertension worsened in patients receiving usual care. The results remained significant after adjustment for various cardiovascular risk factors.
25	Schopp LH, Johnstone BR, Merveille OC. Multidimensional telecare strategies for rural residents with brain injury. J Telemedicine and Telecare 2000; 6(1):146-149. **USA**	In the assessment study, the clinical interview portion of the neuropsychological evaluation was conducted either in person or via interactive videoconferencing. In the psychological study, 13 patients were given psychotherapy sessions by high-quality videoconferencing to augment in-person weekly sessions. During the training study part, mental health providers participated in a series of one-to-one videoconferencing training sessions designed to give an overview of behavioural support treatment for brain injury.	n=52 intervention n=52 matched control Psychology study had 13 participants. Training study had 39 mental health providers.	Outcome of assessment study: patients consider high quality videoconferencing as an acceptable substitute for an in-person visit. Neuropsychologists gave video conferencing a much lower rating. In the psychology study, patients who received telemedicine were much less likely to want to repeat their experience. In the training study, it suggests that telemedicine can be used to enhance access to appropriate care through local channels, rather than diverting care to urban specialists.

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26	Simpson J, Doze S, Urness D, Hailey D, Jacobs P. Telepsychiatry as a routine service- the perspective of the patient. J Telemedicine and Telecare 2001; 7:155-160. **Canada**	Teleconsultations were provided between a major health centre (Alberta Poona Hospital) and hospitals servicing small towns. After each consultation was completed, the patient was given a satisfaction questionnaire by the telehealth site coordinator.	The age profile of the sample paralleled that of the general population.	Patients' opinions on the quality of the equipment were obtained from the questionnaire survey. There was a high level of approval during routine use of telepsychiatry. The satisfaction ratings during the three year period covering the pilot project and the routine telepsychiatry service was consistently higher than the target of 80% set for the Alberta Mental Health Board for teleconsultations. 74% would have suffered some financial disadvantage if they had to travel to their usual referral centre rather than use telemedicine. Acceptance of equipment was high, despite the occurrence of occasional technical problems.
27	Smith AC, Isles A, McCrossin R, Van der Westhuyzen J, Williams M, Woollett H, Wooten R. The point-of-referral barrier - a factor in the success of telehealth. J Telemedicine and Telecare 2001; 7(2):75-78. **Australia**	Both intervention sites were given exclusive access to a single mobile telephone number. This number was a direct link to the telehealth coordinator. The telehealth coordinator liaised with the clinicians and coordinated the necessary response. Responses varied and included either a return telephone call from a specialist, an email message, or a consultation with specialists via videoconference. Once a referral was made, a response was confirmed within 24 h.	none	In the first 6 months the telepaediatric service managed 85 referrals, of which 81 involved clinical care. The remaining four involved point-to-point clinical education sessions. A total of 110 patients were seen during the 6-mo. period. In Apr. 2001, 6 mo. after the start of the project, clinical consultations via V/C increased to an average 8h/mo., the principal purpose being direct or indirect patient care. A review of case reports showed that the project had prevented at least 12 transfers to the RCH. Cost savings between Nov. 2000 - Apr. 2001: US$ 9,000. Other benefits included improved planning and coordination of outpatient and inpatient services.

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28	Stiles N, Boosalis M, Thompson K, Stinnett D, Rayens MK. Nutrition telemedicine consultation for rural elders. J Nutrition for the Elderly 1998; 18(1):47-55. **USA**	The nutrition consultant interviewed each participant via full motion compressed video with a two monitor system to allow the participant and the consultant to see each other. The consultant began the telemedicine interview with a brief introduction covering the procedures for the consultation, how the equipment worked, and also allowed for a few minutes for the participant to become comfortable with the technology. Medical diagnosis were reviewed; dietary history. Nutritional assessment was done. Dietary recommendations were given taking into account the potential problems that may be encountered in this rural region. Immediately following the consultation, the participant and consultant completed a standardized questionnaire about the experience.	n=20	Estimated travel time and costs were reduced because of the availability of the consult via telemedicine. The average distance traveled by participants to the telemedicine site was 23 miles with an average travel time of 37.5 minutes. If the telemedicine was not available, the participants estimated they would have had to drive 65.5 miles and spend 80 minutes on the road to reach the nutrition consultant at the university medical centre. The information obtained during the telemedicine interview was sufficient to identify nutritional concerns in all participants. All components of a nutritional assessment were available to the consultant. Consultations averaged 48 minutes in duration.

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29	Swanson B. Information technology and under-served communities. J Telemedicine and Telecare 1999; 5(2):3-10. **Australia**	The first case study looks at telepsychiatry. The major application has been the provision of remote specialist psychiatrist consultations for acute psychiatric problems in rural patients. At the completion of the consultation the consultant telephones the general practitioner to discuss the diagnostic assessment and treatment recommendations. The second case study explains how one medical school uses video conferencing and IT to enable students to study from their local region in the northern territory.	none	The development of IT and telecommunications is causing major changes. The outcome will be mixed. The winners will be those individuals and communities best placed to take advantage of the changes. They will be the "information rich". Others will be the "information poor" and will not only miss out on the new on-line world but will lose the services which it replaced.

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30	Tsilimigaki A, Maraka S, Tsekoura T, Agelakou V, Vekiou A, Paphitis C, Thanopoulos V. Eighteen months experience with remote diagnosis, management and education in congenital heart disease. J Telemedicine and Telecare 2001; 7:239-243. **Greece**	A telemedicine link was established with the hospital in Crete and the main hospital in Greece. In addition, there were three other telemedicine connections established. There were no interpretation differences between the original and the transmitted studies, and the transmitted images were considered to be of diagnostic quality.	none mentioned	44 children were managed locally and so, as a result of the teleconsultation, avoided transportation. In addition, 46 children had a scheduled appointment at a tertiary center for further evaluation and treatment. These children were transported non-urgently to Athens, thus reducing the risk and inconvenience to the patient and the family while also saving resources. The cost of buying the equipment plus installation was US$16,250 per site. The telecommunication cost between Athens and tertiary site was $50/hr. The average time spent per patient was 15 minutes. Thus, the telecommunication cost was $12.5 per patient.
31	Tually P, Parrish F, and Walker J. Nuclear medicine teleradiology in regional and rural centres of Western Australia. J Telemedicine and Telecare, 1999; 5:47-50. **Australia**	Introduction of a teleradiology service.		A survey of local medical practitioners shoed an increased awareness about nuclear medicine indications and increased confidence when administering treatment. There has been a notable shift in the referral pattern and early diagnosis of radio-occult ankle injuries. Clinical outcomes of these injuries have been shown to be significantly improved by early diagnosis; and teleradiology has provided rural areas with local access to advanced imaging and early diagnosis. There is a savings in time and money for the patient.

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#	Author / Title / Journal / Year / Country	Intervention/ Duration	Follow-up: sample size; dropout	Outcomes/ Socio-Economic Indicators
32	Tually P, Walker J, Cowell S. The effect of nuclear medicine telediagnosis on diagnostic pathways and management in rural and remote regions of Western Australia. J Telemedicine and Telecare, 2001, 7: 50-53. **Australia**	Survey done at beginning of study and again after 3 years		Various outcomes reported including: -timeliness of access a main factor to be considered -38 studies were given a high pre-test likelihood for transfer to metropolitan hospital if a local nuclear medicine service was unavailable The authors are addressing the issue of diagnosis as the paramount goal of this evaluation and how it can be achieved faster, but this does not necessarily result in a direct benefit for the patient as the services required to correct or treat the disease may not be available locally and travel to metropolitan areas could still be required.
33	Vassallo DJ, Hoque F, Farquharson Roberts M, Patterson V, Swinfen P, Swinfen R. An evaluation of the first year's experience with a low-cost telemedicine link in Bangladesh. J Telemedicine and Telecare 2001; 7:125-138. **Bangladesh**	In July 1999, the Swinfen Charitable Trust in the UK established a telemedicine link in Bangladesh, between the Centre for the Rehabilitation of the Paralyzed (CRP) in Dhaka and medical consultants abroad. This low-cost telemedicine system used a digital camera to capture still images, which were then transmitted by email.	none	27 telemedicine referrals were sent during the first 12 months. 23 referral images contained images. 5 different specialties were consulted. Notwithstanding the difference between specialties, the short time overall compares favourably with standard outpatient referrals within the UK, especially for orthopedics and neurology. Telemedicine judged by the CRP staff to be beneficial to the patient in 24 cases. Benefits included the establishment of the diagnosis, reassurance to the patient and referring doctor, and a change of management. 4 patients and their families were spared the considerable expense and unnecessary stress of travelling abroad for a second opinion.

Note: Abbreviations used in this document are described in Appendix D

#	Author / Title / Journal / Year / Country	Intervention/ Duration	Follow-up: sample size; dropout	Outcomes/ Socio-Economic Indicators
34	Watanabe M, Jennett P, and Watson M The effect of information technology on the physician workforce and health care in isolated communities: the Canadian picture. J Telemedicine and Telecare, 1999. 5:11-19. **Canada**	None	None	The Information Highway Advisory Council it its 1995 report indicated that a national health information infrastructure would have benefits including: -all on line diagnostic consultations in a timely fashion, improve quality of care and reduce costs -provide care closer to home preventing costs incurred by unnecessary transportation TM has assisted in remote Canadian communities where the ratio between physicians and patient is growing
35	Woods KF, Johnson JA, Kutlar A, Daitch L, Stachura ME. Sickle cell disease telemedicine network for rural outreach. J Telemedicine and Telecare 2000; 6:285-290. **USA**	Contacts were made with telemedicine coordinators in the remote target areas and the SCD clinic nurse was trained to facilitate the telemedicine examination. The nurse performed triage, and faxed the data to the consultant immediately before the telemedicine encounter. The consultant began the encounter by taking a focused history and reviewing medications. At the completion of the encounter, the consultant discussed the plans with the patients.		Number of encounters increased over time. During the study, there was a progressive increase in the overall clinical productivity of the adult programme. While an increase in provider time to staff the new clinics was necessary, extensive travel and time away from the Sickle Cell Centre was not required.

Note: Abbreviations used in this document are described in Appendix D

APPENDIX L: RURAL REMOTE

#	Author / Title / Journal / Year / Country	Methodological Problems	Policy Recommendations	Applicability to Alberta
1	Boulanger B, Kearney P, Ochoa J, Tsuei B, Sands F. Telemedicine: a solution to the follow-up of rural trauma patients? J Am Coll Surg 2001: 447-452. **USA** Kentucky	No controls Bias - one physician performed 20/22 of TM consults Travel distance and time for appointment impacted, otherwise no outcomes analysis	Rural trauma care via TH is feasible. Studies required to better determine patient and system outcomes.	Yes. Additional TH application for consideration.
2	Bracale M, Cesarelli M, Bifulco P. Telemedicine services for two islands in the Bay of Naples. J of Telemedicine and Telecare 2002; 8: 5-10. **Italy**	no controls no clinical effectiveness measures	Costs-consequences analysis suggested that the TM service is worthwhile TM, even if only cost neutral, can significantly improve health service delivery to relatively isolated communities	Little; Alberta is already using TH to enhance service to remote communities.

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APPENDIX L: RURAL REMOTE

#	Author / Title / Journal / Year / Country	Methodological Problems	Policy Recommendations	Applicability to Alberta
3	Campbell JD, Harris KD, Hodge R. Introducing telemedicine technology to rural physicians and settings. J of Family Practice 2001; 50(5): 419-424. **USA**	Limitation: re. generalisability to other rural settings. The study presented perceptions of providers who were just beginning to adjust to new technologies. (Before the implementation of TM, all of the participants had minimal experience with information technology.)	The "readiness" of a rural community to utilise telehealth depends on perceptions related to 6 themes. These must be well understood & interpreted for successful implementation. Utilise the classification scheme describing a rural practice's readiness to change, and the associated strategies for implementing new technologies in each category. For example, for communities with higher "readiness", include physicians and administrators in the entire planning and implementation process; for communities with partial "readiness", engage in coalition building within the community and with other specialty physicians. Help is needed to create a new vision and to communicate this; and for communities with lower "readiness", present physicians with current evidence-based medical information. Coalition-building and inclusion in planning are also important.	Yes. The classification scheme and associated strategies for implementing new technologies in each category could assist in current and future programs.

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#	**Author / Title / Journal / Year / Country**	**Methodological Problems**	**Policy Recommendations**	**Applicability to Alberta**
4	Capalbo SM, Heggem CH. Evaluating technologies in rural settings. Policy Issues Paper No. 10 1999:1-15. **USA**	Descriptive article	A relevant policy question is: what combination of services and delivery is most efficient, and how does that change as the demographic and geographic parameters change? Emphasises that TH becomes more attractive as the distance to alternate care increases. Focuses on access, quality, and cost of TH service as appropriate parameters.	Provides some policy focus.

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#	Author / Title / Journal / Year / Country	Methodological Problems	Policy Recommendations	Applicability to Alberta
5	Chua R, Craig J, Wootton R, Patterson V. Cost implications of outpatient teleneurology. J. Telemedicine and Telecare 2001; 7: 62-64. **UK**			

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APPENDIX L: RURAL REMOTE

#	Author / Title / Journal / Year / Country	Methodological Problems	Policy Recommendations	Applicability to Alberta
6	Darkins A, Dearden CH, Rocke LG, Martin JB, Sibson L, Wootton R. An evaluation of telemedical support for a minor treatment centre. J Telemedicine and Telecare 1996; 2: 93-99. **UK**	Cost of other alternatives to the TM link not discussed, e.g., sending all 51 questionable cases to local A&E	TM link for trauma and minor injuries was an extremely cost-effective way of providing medical expertise to cover the clinical risk of the 0.5 - 1.5% of the case load that required expert medical opinion. Similar model of care could enhance GP-led minor A&E unit or MTC Costs could be reduced further if one A&E dept. supported several MTCs	May offer an additional TH application for broader consideration.

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APPENDIX L: RURAL REMOTE

#	Author / Title / Journal / Year / Country	Methodological Problems	Policy Recommendations	Applicability to Alberta
7	Ferris DG, Macfee MS, Miller JA, Litaker MS, Crawley D, Watson D. The efficacy of telecolposcopy compared with traditional colposcopy. Obstetrics and Gynaecology 2002; 99:248-254. **USA**	No preclinical telecolposcopy image interpretation training was conducted. Variation in method: if the distant expert was not available at the time of the exam, a video recording of the local colp'sts exam was observed at a later time.	Synchronous viewing is preferred (i.e., distant expert available in real-time for procedure) Federal legislation designed to open the access of TM to women confronted with geographic barriers to health care is needed desperately. International telecolposcopy free to grow without regulatory and financial burden -- high need for this in parts of the world. Further research required re. CE & C-B analysis and psychological impact on women.	Consider for inclusion in Alberta's cancer programs.

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APPENDIX L: RURAL REMOTE

#	Author / Title / Journal / Year / Country	Methodological Problems	Policy Recommendations	Applicability to Alberta
8	Guitierrez G. Medicare, the internet, and the future of telemedicine. Crit Care Med 2001; 29(8):144-150. **USA**	Not an empirical study.	Identifies that policy lead (here, reimbursement) has a profound impact on utilisation of TM. Raises issue of how to ensure the ethical and cost-effective application of TM.	Need for policy lead.

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APPENDIX L: RURAL REMOTE

#	Author / Title / Journal / Year / Country	Methodological Problems	Policy Recommendations	Applicability to Alberta
9	Hagan L, Morin D, Lepine R. Evaluation of Telenursing outcomes: satisfaction, self-care practices and cost savings. Public Health Nursing 2000: 17(4): 305-313. **Canada**	Stated that the study period (fall 1997) followed upon a promotional campaign for the service Possible social desirability bias, i.e., callers report higher-than-actual compliance, self-care ability, or satisfaction levels % of callers who would have resorted to another resource is likely an underestimate Differences in demographics of those who agreed to participate and those who did not. Persons with psychosocial problems are likely under-represented.	Telenursing can lead to 2 factors which predispose the adoption of health care behaviours: perceived self-efficacy and perceived behaviour effectiveness. The program promotes appropriate use of resources and has a 'significant' impact on the health and social service system. Telenursing helps save money for both the individuals and the health care system. The quality of this service depends partly on computerised nursing protocols but primarily on clinical judgment and communication skills.	None. Alberta has an equivalent system.

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#	Author / Title / Journal / Year / Country	Methodological Problems	Policy Recommendations	Applicability to Alberta
10	Hailey D. Some successes and limitations with telehealth in Canada. J Telemedicine and Telecare 2001; 7(Suppl. 2): S2:73-75. **Canada**	n/a	Organizational change and medico legal issues are probably the 2 areas where V/C in TH in Canada still faces its greatest challenges. Degree of success of TM programs depends on the need for the service, structure of local health services and "people" factors, esp. acceptance by users. Identifies the use of the simple telephone as still an effective TH tool.	Need for policy lead, addressing of 'people' issues, and use of appropriate technology for the job.

Note: Abbreviations used in this document are described in Appendix D

#	Author / Title / Journal / Year / Country	Methodological Problems	Policy Recommendations	Applicability to Alberta
11	Hawker F. Telepsychiatry in South Australia. J. Telemedicine and Telecare 1998; 4:187-194. **Australia**	n/a	Minimise barriers by ensuring policy needs are addressed. Address human factors and fears. Several elements are critical to development and embedding of a telepsychiatry service within a clinical system: achievement of awareness, acceptance and support from all involved, the level and spirit of cooperation between the various professional groups and both the rural and metropolitan site, and the ability to have reliable equipment and prompt technical support.	Reinforces need for policy lead, importance of addressing human factors, and lessons that still have not been learnt!

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#	Author / Title / Journal / Year / Country	Methodological Problems	Policy Recommendations	Applicability to Alberta
12	Health Canada (Wong RW). Sharing the learning: the health transition fund. Synthesis series; Rural Health / Telehealth 2002:1-30. **Canada**	Not a 'systematic review'	Many rural health problems cannot effectively be solved by piecemeal measures. Health workforce maldistribution has been, and will continue to be, a major challenge. Not all solutions to rural health problems are to be found in the health care domain. TH is going to be important for rural health in overcoming disadvantages associated with large distances and small populations. To be effective in supporting rural health, TH must be 'owned' by rural communities and practitioners, rather than being 'urban-imposed'. As utilisation rate increases or as technology becomes more affordable, the per contact episode cost is likely to decline. Little is known about the effects of TH on health services delivery in a rural context, changes in practitioners' roles, patient referral patterns and long term implications. Policy implications such as these have not received adequate attention. Policies that under gird TH services and our understanding of the impact of TH on the rural health care system are mostly lagging. There is a need to address these aspects, lest TH forge ahead in a policy vacuum.	Reinforces need for policy lead, importance of addressing human factors such as 'rural ownership' of TH solutions

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#	Author / Title / Journal / Year / Country	Methodological Problems	Policy Recommendations	Applicability to Alberta
13	Hunkeler EM, Meresman JF, Hargreaves WA, Fireman B, Berman WH, Kirsch AJ, Groebe J, Hurt SW, Braden P, Getzell M, Feigenbaum PA, Peng T, Salzer M. Efficacy in nurse telehealth care and peer support in augmenting treatment of depression in primary care. Arch Fam Med 2000; 9:700-708. **USA**		Nurse-based TH care improves clinical outcome and can be incorporated into primary care settings. Peer support may be beneficial when it is clearly structured and is the only augmentation to usual physician care.	Augmentation of Alberta's already well established and respected telemental health program.

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#	Author / Title / Journal / Year / Country	Methodological Problems	Policy Recommendations	Applicability to Alberta
14	Jennett PA, Hall WG, Morin JE, Watanabe M. Evaluation of a distance consulting service based on interactive video and integrated computerized technology. J. Telemedicine and Telecare 1995; 1:69-78. **Canada**	No information on what kind of statistical analysis was undertaken.	Need to provide funds to support the technical and nursing personnel required to operate the system on a day-to-day basis. Need to provide a reliable and consistent method for initiating a consultation that is free from administrative hurdles such as lack of personnel, scheduling conflicts.	Alberta TH example.
15	Johnson A, Gorman M, Lewis C, Baker F, Coulehan N, Rader J. Interactive videoconferencing improves nutrition intervention in a rural population. J. American Diatetic Association 2001; 101(2):173-174. **USA**	Unclear as to where the sample of 24 were recruited from. No mention of inclusion or exclusion criteria. Small sample	Healthcare provider misgivings re technology and use of technology must be overcome (patients were comfortable, providers had misgivings).	General.

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#	Author / Title / Journal / Year / Country	Methodological Problems	Policy Recommendations	Applicability to Alberta
16	Lamb A, Eydmann M, Boddy K. Remote maternity. The British Journal of Healthcare Computing & Information Management 1997; 14(7):22-24. **UK**	Descriptive article.	Some socio-economic value in introducing TH services for 'remote' high-risk maternity patients.	Potential application for consideration.
17	Liesenfeld B, Renner R, Neese M, Hepp KD. Telemedical care reduces hypoglycaemias and improves glycaemic control in children and adolescents with type 1 diabetes. Diabetes Technology & Therapeutics 2000: 2(4):561-567. Germany		Education programs that address the early recognition and treatment of hypoglycemic attacks and the correct implementation of intensive therapy are the cornerstone in the prevention of hypoglycemic attacks. TH can mediate such interventions.	Yes. Potential application for consideration. (Note: SLICK program).

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APPENDIX L: RURAL REMOTE

#	Author / Title / Journal / Year / Country	Methodological Problems	Policy Recommendations	Applicability to Alberta
18	Minister of Research, Science and Technology of Quebec, Minister of Health and Social Services of Quebec. Telehealth and telemedicine in Quebec: current issues. 1999:1-81. **Canada**	n/a	Five components of a (Quebec) telehealth policy require clarification; 1) the interpersonal aspects, 2) the shift toward ambulatory care, 3) the legal aspects, 4) pilot projects, and 5) the telehealth diffusion plan. Need to assess the impact of implementing networks on pre-existing interpersonal dynamics and on those that will emerge. Necessary to check if health needs are being met by the new communications technologies, adopting the perspectives of the persons being treated, and if a cost analysis confirms that these new services are cost-effective. The issues of reimbursement and physicians obtaining practice privileges will arise at the intra- and interprovincial levels.	Yes. Identifies pertinent policy issues relevant to Alberta.
19	Monrad Aas IH. Changes in the job situation due to telemedicine. J Telemedicine and Telecare 2002; 8: 41-47. **Norway**	Transferability of findings to other settings may depend on similarity of context.	Identifies organizational changes as a significant and poorly understood impact caused by TH. If need for TH increases in future, suggest large clinics (e.g., university clinics) where TM work can be distributed across many specialists.	Yes.

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APPENDIX L: RURAL REMOTE

#	Author / Title / Journal / Year / Country	Methodological Problems	Policy Recommendations	Applicability to Alberta
20	Nesbitt TS, Hilty DM, Kuenneth CA, Siefkin A. Development of a telemedicine program: a review of 1000 videoconferencing consultations. West J Med. 2000; 173:169-174. **USA**	Participation was voluntary therefore results may not be representative of all physicians' and patients' willingness to use this modality of care -no clinical outcome ratings, only subjective ratings of satisfaction -q'aire not administered to every patient -study group not randomized and no control group	Use of TM may result in increased medical interventions among the patients who use it because it is being introduced to patient groups who before the availability of TM had limited access to specialist services	
21	Oakely AMM, Kerr P, Duffill M, Rademaker M, Fleischl P, Bradford N, Mills C. Patient cost-benefits of realtime teledermatology- a comparison of data from Northern Ireland and New Zealand. J Telemedicine and Telecare 2000; 6:97-101. **New Zealand**		Secondary healthcare may be more expensive for patients in rural areas because they have to travel further to receive the same care as their urban counterparts. Benefits accrue mainly to the patient rather than the healthcare system.	Potential application for consideration.

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APPENDIX L: RURAL REMOTE

#	Author / Title / Journal / Year / Country	Methodological Problems	Policy Recommendations	Applicability to Alberta
22	O'Neill SK, Denton GL, Brockway PD, Davidson M, Wallsten D. Demonstration of the usefulness of telehealth in providing enhanced primary health services to the northern, geographically remote communities of Trout Lake, Peerless Lake and Red Earth Creek, Alberta. Keeweetinok Lakes Regional Health Authority no. 15.:4-45. **Canada**		Regional telehealth system with multiple sites requires a phase in process. Implement telehealth facilities in a few sites initially to ensure integrity of the system and to promote the integration of this technology into the existing health service delivery system. Establish a regional telehealth steering committee to guide and direct implementation and application processes. *Human factors outweigh technology. One can install the best telehealth system money can buy, but without appropriate stakeholder support, training and buy in, the system will not be used as to its greatest potential.*	Yes.

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APPENDIX L: RURAL REMOTE

#	Author / Title / Journal / Year / Country	Methodological Problems	Policy Recommendations	Applicability to Alberta
23	Piette JD, Weinberger M, McPhee SJ. The effect of automated calls with telephone nurse follow-up on patient-centered outcomes of diabetes care. Med Care 2000; 38:218-230. **USA**	Good study. Some potential bias due to use of only one site and one nurse educator.	ATDM calls with nurse telephone follow-up improves some patient centered outcomes of diabetic care (depression, self-efficacy, days in bed due to illness, satisfaction with care).. Literacy is an issue. Many individuals lack the reading skills required to use computer-based written information and experience worse health outcomes directly attributable to their literacy problems. Telephone-based interventions could be implemented without requiring patients to use computers or the internet and could improve health care access for patients who are poor, are functionally illiterate, or face other barriers to both traditional and high-tech health care.	Yes. Potential application for consideration.

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#	Author / Title / Journal / Year / Country	Methodological Problems	Policy Recommendations	Applicability to Alberta
24	Rogers Mary AM, Small D, Buchan DA, Butch CA, Stewart CM, Krenzer BE, Husovsky. Home monitoring service improves mean arterial pressure in patients with essential hypertension. Ann Intern Med 2001; 134:1024-1032. **USA**		TH can be used to reduce mean arterial blood pressure of patients with essential hypertension. The 'downstream' impact of this on the healthcare system is unknown at this time.	Yes. Potential application for consideration.
25	Schopp LH, Johnstone BR, Merveille OC. Multidimensional telecare strategies for rural residents with brain injury. J Telemedicine and Telecare 2000; 6(1):146-149. **USA**	Is unclear whether the 13 psychology patients came from the pool of 52. No mention of inclusion/exclusion criteria.	Clinicians continue to require support and education in the use of telemedicine, so that they see it as an acceptable alternative to in-person services. Given adequate training and ongoing support, rural clinicians can treat many brain-injury adjustment issues locally, reserving specialist consultation for emergency or complex problems.	Yes. Potential application for consideration.

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APPENDIX L: RURAL REMOTE

#	Author / Title / Journal / Year / Country	Methodological Problems	Policy Recommendations	Applicability to Alberta
26	Simpson J, Doze S, Urness D, Hailey D, Jacobs P. Telepsychiatry as a routine service- the perspective of the patient. J Telemedicine and Telecare 2001; 7:155-160. **Canada**		Sustained telepsychiatry service improves access, reduced waiting times, and reduces patient related costs. Although patient related cost savings have no direct effect on the healthcare budget, additional costs to patients may deter them from travelling for psychiatric consultations, so that mental health services are not delivered. From the governments perspective, this raises questions regarding equity of access to services, and long term and costly care from delayed intervention.	No. Sustained telemental health service is currently provided within Alberta.
27	Smith AC, Isles A, McCrossin R, Van der Westhuyzen J, Williams M, Woollett H, Wooten R. The point-of-referral barrier - a factor in the success of telehealth. J Telemedicine and Telecare 2001; 7(2):75-78. **Australia**	Hard to determine if results are due to tested hypothesis or some other factor.	Providing a direct and convenient tele-referral service for the referring practitioner increases the popularity of TH. For telepaediatrics this resulted in increased access for patients, and projected cost savings to the system.	Yes. Potential application for consideration.

#	Author / Title / Journal / Year / Country	Methodological Problems	Policy Recommendations	Applicability to Alberta
28	Stiles N, Boosalis M, Thompson K, Stinnett D, Rayens MK. Nutrition telemedicine consultation for rural elders. J Nutrition for the Elderly 1998; 18(1):47-55. **USA**	There is a need for increased resources targeting the nutritional health of rural elders with chronic medical conditions.	Malnutrition for rural elders can be a significant and debilitating complication. Geriatric nutrition counseling can be performed by TH. Benefits (access, travel, cost) accrue to the patient.	Yes. Potential application for consideration.

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#	Author / Title / Journal / Year / Country	Methodological Problems	Policy Recommendations	Applicability to Alberta
29	Swanson B. Information technology and under-served communities. J Telemedicine and Telecare 1999; 5(2):3-10. **Australia**		There is much work to be done on specific policies and their implementation. Priority areas such as infrastructure, training, standards development, legal and regulatory frameworks and raising awareness of the potential of IT are all huge issues in their own right. Telemedicine has suffered from being oversold as a solution to a range of health-service problems in rural regions. It is perceived as a centrally imposed solution to a rural problem. The development of telemedicine services will have implications for the workforce. Rural and remote regions have lower rates of utilization than most. If telemedicine allows this utilization to rise towards metropolitan rates, there will be a requirement for a commensurate expansion of the medical workforce. The likely social effects are 'location independence' of a range of activities and widening gaps between the information rich and information poor. [Appropriate policy may ameliorate this potential outcome].	Yes. Good discussion of policy issues and Australian response.

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#	Author / Title / Journal / Year / Country	Methodological Problems	Policy Recommendations	Applicability to Alberta
30	Tsilimigaki A, Maraka S, Tsekoura T, Agelakou V, Vekiou A, Paphitis C, Thanopoulos V. Eighteen months experience with remote diagnosis, management and education in congenital heart disease. J Telemedicine and Telecare 2001; 7:239-243. **Greece**	Unclear as to how many children/consultation constitute the sample.	Telecardiology provides high-risk children and their parents with better access and reduced travel.	Yes. Potential application for consideration.
31	Tually P, Parrish F, and Walker J. Nuclear medicine teleradiology in regional and rural centres of Western Australia. J Telemedicine and Telecare, 1999; 5:47-50. **Australia**		Evaluations which concentrate on medical outcomes are required to prove that the enhanced access to specialists improves overall patient management.	Yes.

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#	Author / Title / Journal / Year / Country	Methodological Problems	Policy Recommendations	Applicability to Alberta
32	Tually P, Walker J, Cowell S. The effect of nuclear medicine telediagnosis on diagnostic pathways and management in rural and remote regions of Western Australia. J Telemedicine and Telecare, 2001, 7: 50-53. **Australia**		Availability of radiology support impacted the delivery of care in terms of diagnostic work-up, which in turn detected disease earlier, changed management, and reduced patient transfer. Most diagnostic nuclear medicine procedures cannot be properly offered unless a multi-disciplinary team is available for immediate consultation	Yes.
33	Vassallo DJ, Hoque F, Farquharson Roberts M, Patterson V, Swinfen P, Swinfen R. An evaluation of the first year's experience with a low-cost telemedicine link in Bangladesh. J Telemedicine and Telecare 2001; 7:125-138. **Bangladesh**	Small amount of referrals	Canada's international role in TH could be enhanced by similar Canadian led activities. There has been little practical experience with telemedicine of a direct clinical kind in the developing world, which contains 80% of the world's population. Arguably, it is those same countries that stand to gain most from a simple and cheap telemedicine system, on the principle that it could improve access to health-care and specialists, and enhance research and the education of local health-care workers. Telemedicine advice is useful, as long as specialists can be relied upon to reply promptly, with consistently high-quality advice and a choice of management options. The referring doctor then chooses the best option in the circumstances.	Yes; 'low tech' solutions must not be overlooked.

#	Author / Title / Journal / Year / Country	Methodological Problems	Policy Recommendations	Applicability to Alberta
34	Watanabe M, Jennett P, and Watson M The effect of information technology on the physician workforce and health care in isolated communities: the Canadian picture. J Telemedicine and Telecare, 1999. 5:11-19. **Canada**		There is a need for evaluation, that is, many telehealth projects have been evaluated as efficacious, but Telehealth now is poised for effectiveness studies to determine whether the benefits can be maintained in 'real life' conditions Human factors are important in the development and implementation of TM, need to understand the effect of technology on health providers, patients and the health care system, which is critical to the successful adoption of TM	Yes. Effectiveness studies will require large-scale, sustained programs.
35	Woods KF, Johnson JA, Kutlar A, Daitch L, Stachura ME. Sickle cell disease telemedicine network for rural outreach. J Telemedicine and Telecare 2000; 6:285-290. **USA**		TH increases access for rural or remote patients with rare diseases, without an increase in the number of specialists.	Yes. Potential application for consideration.

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APPENDIX M: CRITIQUE TELEREHABILITATION

Author/ Article Title / Year/ Country / Location	**Purpose/ Objectives**	**Design**	**Analysis**	**Participants: age/ gender/ groups**	**Intervention/ Duration**	**Follow-up: sample size; dropout**	**Outcomes/ Socio-Economic Indicators**
Ades PA, Pashkow FJ, Fletcher G, Pina IL, Zohman LR, Nestor JR. A controlled trial of cardiac rehabilitation in the home setting using electrocardiograph and voice transtelephonic monitoring. Am Heart J 2000; 139(3):543-548. **USA**	Goal of the study was to compare the effectiveness of home based, transtelephonically monitored cardiac rehab with standard, onsite, supervised cardiac rehab	Non-randomized controlled prospective trial (IV) Multicentre Strength of Evidence (SoE): Poor Patients assigned to intervention (home-based) or control (on-site) groups based on geographical "remoteness" from clinic site. Health status Questionnaire	Effects of a 3 month home-based, transtelephonically monitored rehab program with simultaneous voice and eletrocardiographic transmission to a centrally located nurse coordinator were compared with effects of a standard onsite rehab program	Transtelephonically monitored rehab program n=83 patients Standard on site rehab program n=50 patients 2 study groups comparable at baseline by age, sex, fitness, and quality of life measure	3 months Home group took 13.5 weeks to complete the program Onsite group took 13.9 weeks to complete the program	Transtelephonically monitored group: dropout rate 9% (8 of 91) Onsite group: dropout rate 8% (4 of 54)	Both groups increased their maximal work capacity of quality of life measures similarly

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Author/ Article Title / Year/ Country / Location	Purpose/ Objectives	Design	Analysis	Participants: age/ gender/ groups	Intervention/ Duration	Follow-up: sample size; dropout	Outcomes/ Socio-Economic Indicators
Artunian J. Telemedicine links providers to patients. Rehab Management 1997:54-58.	Discusses telerehabilitation programs in Texas and at Shepherd Centre, Atlanta, Georgia and Describes advantages of TH	Descriptive (VIII) SoE: Poor	None	None	None	None	Suggested advantages of TR: - (pediatrics) TH makes it easier for others involved in a child's care to participate in their rehabilitation; i.e., therapists, social workers, case managers - a TM system for severely disabled children reduced the patient no-show/cancellation rate - TM can facilitate assessment of certain problems that occur a specific situations (e.g., infant feeding problem) - video link to patient's home give the provider more insight into problems related to the family or the home itself - TR gives rehab practitioners an opportunity to grow their practices

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APPENDIX M: CRITIQUE TELEREHABILITATION

Author/ Article Title / Year/ Country / Location	Purpose/ Objectives	Design	Analysis	Participants: age/ gender/ groups	Intervention/ Duration	Follow-up: sample size; dropout	Outcomes/ Socio-Economic Indicators
Bates J, Linn G, Johnson J, MacKay M, Lear S, Johnson P. Outcomes of a web-based cardiac rehabilitation program delivered to patients living in rural and regional centres. Submitted for Publication, 2002. Vancouver BC. Canada	To find if receiving web-based cardiac rehabilitation program would reduce risk behaviours and improve quality of life and depression in rural patients living with coronary artery disease.	Randomized Controlled Trial (II) SoE: unable to evaluate		n=118 patients with documented CVD living in regional and remote settings were recruited and randomized to receive unlimited Internet access alone or combined with access to a web - based cardiac rehab program (CHESS)		n=77 patients completed all phases of the study	No significant differences between treatment and control groups were seen in primary outcome variables (obesity, dietary fat, smoking, exercise level and stress). The treatment group scored significantly lower in qualtiy of life and higher in depression scale.

Note: Abbreviations used in this document are described in Appendix D

APPENDIX M: CRITIQUE TELEREHABILITATION

Author/ Article Title / Year/ Country / Location	Purpose/ Objectives	Design	Analysis	Participants: age/ gender/ groups	Intervention/ Duration	Follow-up: sample size; dropout	Outcomes/ Socio-Economic Indicators
Bates J, Linn G, Johnson J, MacKay M, Woong Yun G, Lear S, Owens B, Wise M. Utilization and Impact on an iNtenet-Based Cardiac Rehabilitaiton Program by Rural Patients with Coronary Artrey Disease. Submitted for Sublication, 2002. **Canada, USA** British Columbia, Wisconsin	To evaluate a web-based patient education and support program to rural patients with heart disease.	RCT (II) SoE: unable to evaluate	Measures: patient utilization, infrastructure difficulties Baseline data collected Follow up survey at 4 months SPSS	n=118 participants recruited cardiac rehabilitation patients Proportion of women in control group higher than in treatment group (25.5% versus 5.4%) mean age of treatment group 60.44 years mean age of control group 60.76 years	6 month trial Patients randomized to receive web-based education & support program or usual internet access Program was implemented using existing infrastructure (patients' own computers, community internet providers, POTS access to the internet)	n= 118 participants recruited n= 84 participants complete follow up at 4 months	Highest use of program was in health tracking software and interactive elements Patients expressed a need for increased personal contact; increased individualized support for lifestyle change; and solid interest in continuing in a web-based outreach program. Thre treatmen group rated all resources as more useful in providing infomration, improving quality of life, coping with their disease, and reducing isolation.

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APPENDIX M: CRITIQUE TELEREHABILITATION

Author/ Article Title / Year/ Country / Location	Purpose/ Objectives	Design	Analysis	Participants: age/ gender/ groups	Intervention/ Duration	Follow-up: sample size; dropout	Outcomes/ Socio-Economic Indicators
Burns RB, Crislip D, Daviou P, Temkin A, Vesmarovich S, Anshutz J et al. Using telerehabilitation to support assistive technology. Assist Technol 1998; 10(2):126-133. **USA** Shepherd Centre, Atlanta	Describe experiences of a specialty hospital serving persons with disabilities in exploring telerehab to support assistive technology use in home	Case reports (IX) SoE: Poor 4 case studies	Technology used Picasso Still Image Video Phone Subjective evaluation of feasibility of use of technology in home for telerehab	74-year-old male paraplegic 38-year-old female multiple sclerosis 23-year-old male quadriplegic 57-year-old male cerebral palsy	Clinical consults with therapist via V/C	Not reported	Telerehab has great promise for expanding availability, accessibility, affordability of services for persons with disabilities Specific outcomes noted for each patient Several problems and challenges with technology are technical, logistical, and financial in nature

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Author/ Article Title / Year/ Country / Location	**Purpose/ Objectives**	**Design**	**Analysis**	**Participants: age/ gender/ groups**	**Intervention/ Duration**	**Follow-up: sample size; dropout**	**Outcomes/ Socio-Economic Indicators**
Cooper M, Keating D. Implications of the emerging home systems technologies for rehabilitation. Med Eng Phys 1996; 18(3):176-180. **UK**	Discusses the role computers play in neurorehabilitation Integrated Home Systems ie.communication between different consumer electronic devices in the home so that they can cooperate	Descriptive (XIII) SoE: Poor	Looks at role of computer in terms of communication, motor skills, cognitive functions, social skills, mood, computers for work, and leisure	None	None	None	Computers have an important role to play in the rehab of people with neurological disabilities

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Author/ Article Title / Year/ Country / Location	**Purpose/ Objectives**	**Design**	**Analysis**	**Participants: age/ gender/ groups**	**Intervention/ Duration**	**Follow-up: sample size; dropout**	**Outcomes/ Socio-Economic Indicators**
Couturier P, Tyrrell J, Tonetti J, Rhul C, Woodward C, Franco A. Feasibility of orthopedic teleconsulting in a geriatric rehabilitation service. J Telemed Telecare 1998; 4 Suppl 1:85-87. **France** Centre Hospitalier Universitaire, Grenoble	To examine feasibility of remote orthopedic consultation for the aftercare of elderly people recovering from fractures	Descriptive (VIII) SoE: Poor	Teleconsulting consisted of five distinct phases	n=15 f=14 m=1 mean age=85years	Duration of consultation longer for surgeon than referring doctor Interventions done on each patient were teleconsulting and face to face	n=15 participants began and completed the study	Doctors' opinions indicate overall satisfaction Patient attitudes towards teleconsulting technique favourable
Debray M, Couturier P, Greuillet F, Hohn C, Banerjee S, Gavazzi G et al. A preliminary study of the feasibility of wound telecare for the elderly. J Telemed Telecare 2001; 7(6):353-358. **France** Grenoble	To develop a method for remote wound assessment in the elderly using digital images	Case report (IX) SoE: Poor	Equipment used was a digital camera, images transferred via e-mail	Patients n=3 inpatients at a hospital geriatric department Three physicians	One physician took photos of wounds who was not involved in wound assessment One physician read clinical data and examined digital photo images One physician did onsite examinations	No reported dropout	The validity and reliability of remote wound assessment in the elderly using this method may be acceptable, but further studies are required Remote physician did have some difficulty with assessment due to lack of palpation

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APPENDIX M: CRITIQUE TELEREHABILITATION

Author/ Article Title / Year/ Country / Location	Purpose/ Objectives	Design	Analysis	Participants: age/ gender/ groups	Intervention/ Duration	Follow-up: sample size; dropout	Outcomes/ Socio-Economic Indicators
Hauber RP, Jones ML, Temkin AJ, Vesmarovich S, Phillips VL. Extending the continuum of care after spinal cord injury through telerehabilitation. Topics in Spinal Cord Injury Rehabilitation 5[3], 11-20. 1999. **USA** Shepherd Centre, Atlanta	Spinal cord injury (SCI) care after hospital release Describes the Shepherd Centre's exploratory work in the field of telerehab	Descriptive, review article (XIII) SoE: Poor Mentions that currently, randomized trial is underway	Not reported	Various treatment of patients at Shepard Centre in Atlanta	Article discusses various studies done on potential of telerehab in preventing pressure ulcers; and the effectiveness of telerehab in treating pressure ulcers	None	Telerehab empowers the consumer to take an active role in their own therapy Technology use may be difficult for patients/hospital professionals
Jin C, Ishikawa A, Sengoku Y, Ohyanagi T. A telehealth project for supporting an isolated physiotherapist in a rural community of Hokkaido. J Telemed Telecare 2000; 6 Suppl 2:S35-S37. **Japan** Hokkaido	Reports the experience of the rehab project supporting an isolated physiotherapist in a remote community in Japan	Case Study (IX) SoE: Poor	None	One physiotherapist in remote community three staff members from the university	Meetings conducted via videoconferencing 2-3 times a month for 1 hour meetings lasted 4 months	None	Videoconferencing greatly helped the isolated physiotherapist in the rural community Helped physiotherapist regain confidence in work

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Larsson A, Nystrom C, Vikstrom S, Walfridsson T, Soderback I. Computer-assistive cognitive rehabilitation for adults with traumatic brain damage: four case studies. Occupational Therapy International 1995; 2(3):166-189. **Sweden**	To investigate the value of computer assisted activities for four individuals with brain damage. Cognitive rehab in work-oriented training or as a tool for leisure time activity	Case Reports (IX) SoE: Poor Four case studies Unstructured interviews, questionnaire Methods used for evaluation goal attainment scaling (GAS)	Each study included six steps including data collection, initial assessment, equipment, supervision, conclusion, result Computer equipment chosen to meet participants needs Goals for each person were measured according to evaluation with Goal Attainment Scaling	A: 50-year old male, cerebral hemorrhage B: 54-year old male; extensive brain damage C: 40-year old male; traumatic brain damage D: 40-year old male; traumatic brain injury	12-18 weeks	None	All participants mainly achieved their goals, got pleasure out of computer use The capability and adaptability of the computer must be taking into account when selecting suitable programs and adaptations

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APPENDIX M: CRITIQUE TELEREHABILITATION

Author/ Article Title / Year/ Country / Location	**Purpose/ Objectives**	**Design**	**Analysis**	**Participants: age/ gender/ groups**	**Intervention/ Duration**	**Follow-up: sample size; dropout**	**Outcomes/ Socio-Economic Indicators**
Malagodi M, Smith S. Prospective role for telemedicine as a communication tool for rural rehabilitation practice. Work 1999; 12(3):245-259. **USA**	Discusses ways of improving the delivery of health care in the field of Assistive Technology	Descriptive (XIII) SoE: Poor Telemedicine evaluations various techniques discussed Previous study cited: Focus groups Client Questionnaire	Qualitative literature review	Examination of previous study; no participants for previous study			The utilization of telemedicine for rural rehab will be successful with some cautionary measures
Mathewson C, Adkins VK, Lenyoun MA, Schmidt AM, Jones ML. Using telemedicine in the treatment of pressure ulcers. Ostomy Wound Management 1999; 45(11):58-62. **USA** Shepherd Centre, Atlanta	To assess use of telemedicine in treatment of pressure ulcer in one patient (SCI) who experienced 5 surgeries during the 16 month period prior to enrollment in project	Case report (IX) SoE: Poor	Equipment used was a videophone	Divorced 42-year-old male SCI	6 months For 2 months had assistance of health care nurse, family help thereafter	None	After 6 months, wound stable and manageable; patient now working and independent

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Phillips VL, Temkin A, Vesmarovich S, Burns R, Idleman L. Using telehealth interventions to prevent pressure ulcers in newly injured spinal cord injury patients post-discharge. Results from a pilot study. Int J Technol Assess Health Care 1999; 15(4):749-755. **USA** Shepherd Centre, Atlanta	To determine which of three approaches to care produces the lowest incidence of pressure ulcers, promotes the more effective care of sores that develop, and leads to the fewest hospitalizations in newly injured patients with SCI after discharge	Non-randomized controlled prospective trial (IV) SoE: Good-Fair Pilot study	Equipment used: videophone	Patients recruited and asked to volunteer if met criteria case matching Telephone n=13 Video n=12 Standard care n=10 Total original n=37	Video group patients participated in weekly video counseling sessions for 6-8 weeks. Following this, they received weekly telephone counseling sessions for 4-6 weeks. Telephone group received weekly telephone-only counseling sessions for 10 weeks	Final n=35 Two drop outs	Video group reported highest number of ulcers Video method was successful in identifying ulcers Substantially more people in video intervention group returned to work Standard care report lowest number of pressure ulcers

Author/ Article Title / Year/ Country / Location	Purpose/ Objectives	Design	Analysis	Participants: age/ gender/ groups	Intervention/ Duration	Follow-up: sample size; dropout	Outcomes/ Socio-Economic Indicators
Phillips VL, Temkin AJ, Vesmarovich SH, Burns R. A feasibility study of video-based home telecare for clients with spinal cord injuries. J Telemed Telecare 1998; 4(4):219-223. **USA** Shepherd Centre, Atlanta	Feasibility study on the use of a telecare intervention to promote skin and other self-care activities for persons with spinal cord injuries (Prevention of pressure ulcers)	Non-controlled clinical series (XIII) SoE: Poor	Equipment used was a video phone which could transmit video and still images over a standard telephone line.	n=14 final n=11 m=9 f=2 mean age 38 years (range 18-58) Participants recruited from Shepherd Centre, clients invited to participate	Average of 10 video calls (range 3-25) Average length of consultation 23 min (range 15-34 min) Durations of interventions varied from 6 to 32 weeks	n=11 3 dropout	Overall impression of 11 clients noted as very positive Study finds video based interventions are an effective, popular way of promoting preventative skin care problems

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APPENDIX M: CRITIQUE TELEREHABILITATION

Author/ Article Title / Year/ Country / Location	**Purpose/ Objectives**	**Design**	**Analysis**	**Participants: age/ gender/ groups**	**Intervention/ Duration**	**Follow-up: sample size; dropout**	**Outcomes/ Socio-Economic Indicators**
Phillips, VL, Vesmarovich S, Hauber R, Wiggers E, Egner, A. Telehealth: Reaching Out to Newly Injured Spinal Cord Patients. Public Health Reports, 2001; 116: 94-116. **USA** Shepherd Centre, Atlanta	The authors present preliminary results on health-related outcomes of a randomized trial of telehealth interventions designed to reduce the incidence of secondary conditions among people with mobility impairments resulting from SCI	RCT (II) SoE: Good Longitudinal study	Observation of participants is still ongoing Health related quality of life was measured using the Quality of Wellness Being (QWB) scale The Centre for Epidemiologic Studies Depression Scale (CES-D) documents the presence of depressive symptoms	Patients with SCI were recruited during their initial stay at a rehab facility in Atlanta. Patients were randomly assigned to: 1) Video group, n=36, 75% male 2) Telephone group, n=36, 72% male 3) Standard care group, n=39, 82% male Average age across groups was 35 years Exclusions were brain injury, substance abuse or only a mild mobility problem	Participants in the video and telephone groups took part in individual educational rehab sessions with a study nurse once a week for 5 weeks, and then once every 2 weeks for 1 month Video group also saw real time images of nurse -intervention sessions lasted 9 weeks -average session lasts 30-40 mins	Follow up interviews took place at week 5 during the intervention and then on a monthly basis for at least one year of follow up	QWB scores (n=111) did not differ significantly between the 3 intervention groups at the end of the intervention period -At year 1 post discharge scores for those completing one year of enrollment (n=47) were significantly higher for the intervention groups compared to standard care -Mean annual hospital days were 3.00 for the video group, 5.22 for the telephone group, and 7.95 for the standard care group -Depressive symptoms declined for all 3 groups, with those in the video group continuing to exhibit more symptoms at one year post discharge than those in the telephone only or standard care groups
Popescu V, Burdea G, Bouzit M, Girone M, Hentz V. PC-based telerehabilitation system with force feedback. Stud Health Technol Inform 1999; 62:261-267. **USA**	Article discusses various technologies used with respect to orthopedic rehab	Descriptive (XIII) SoE: Poor	None	None	None	None	PC based telerehab system using Visual Reality and force feedback interface was developed for home use System scheduled to begin clinical trials in 1998

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APPENDIX M: CRITIQUE TELEREHABILITATION

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Schopp LH, Johnstone BR, Merveille OC. Multidimensional telecare strategies for rural residents with brain injury. Journal of Telemedicine and Telecare 2000; 6:146-149. **USA** Missouri	To assess ability of video conferencing to enhance care for persons with brain injury in three areas: 1. cognitive assessment 2. psychotherapy 3. rural mental health training	Part 1: Non-randomized controlled prospective trial (IV) SoE: Good-Fair Parts 2 & 3: Non-controlled clinical series(VIII) SoE: Poor	not described	Part 1 n=104 rural residents with cognitive dysfunction n=52 seen via V/C n=52 age- & diagnosis-matched controls seen in person Part 2: 13 geriatric patients on a rural inpatient rehabilitation unit, with brain injury or disease, most due to stroke Part 3: 39 rural mental health providers	Part 1: Patients received neuropsychological evaluation clinical interview either via V/C or in person. Part 2: Patients were given psychotherapy sessions via high-quality V/C to augment in-person weekly sessions. Part 3: Providers received a series of 1-to-1 V/C training sessions re. behavioural support tx for brain injury	No drop-out reported In parts 1 and 2, after each interview, patients and interviewers completed satisfaction questionnaires	Part 1: patients more likely to want to repeat their experiences than those seen in person; neuropsychologists using V/C were less satisfied than patients Part 2: as compared to Part 1, patients were less likely to want to repeat their experience Part 3: all 39 providers improved on the test after training

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Sparks KE, Shaw DK, Eddy D, Hanigosky P, Vantrese J. Alternatives for cardiac rehabilitation patients unable to return to a hospital-based program. Heart & Lung: Journal of Critical Care 1993; 22(4):298-303. **USA**	To determine the effectiveness of a home exercise program using transtelephonic exercise monitoring (TEM)	RCT (III) SoE: Good-Fair	A student paired t test was used to determine within group differences between the pretests and posttests Independent Student t test was to determine between group differences	Total n=20 Hospital group n=10 Home group n=10 All males Randomly assigned to either group	12 week program Maximal exercise tolerance tests were conducted before and after exercise intervention on a computer driven bicycle monitor Subjects trained 3 days per week for 12 weeks on a bicycle ergometer for a maximum of 35 mins at 75% if max heart rate reserve or functional capacity	Not reported	Both groups demonstrated significant improvements in cardiovascular endurance Independent Student t tests showed no significant difference between groups before or after training Test time to exercise tolerance and workload also increased Home based patients described that a high degree of psychosocial support resulted from the direct contact with the rehab nurse and the contact with other patients via conference call, thus difficult to determine whether improvements in quality of life reported in both groups were exercise-related or caused in part by the psychosocial support component of each program

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Author/ Article Title / Year/ Country / Location	**Purpose/ Objectives**	**Design**	**Analysis**	**Participants: age/ gender/ groups**	**Intervention/ Duration**	**Follow-up: sample size; dropout**	**Outcomes/ Socio-Economic Indicators**
Squires RW, Miller TD, Harn T, Micheels TA, Palma TA. Transtelephonic electrocardiograph monitoring (TEM) of cardiac rehabilitation exercise sessions in coronary artery disease. American Journal of Cardiology 1991; 67(11):962-964. **USA**	To assess feasibility of Transtelephonic ECG monitoring during cardiac rehab exercise in home or at remote hospital	Non-controlled clinical series (XIII) SoE: Poor Describes the current routine clinical use of transtelephonic ECG monitoring during cardiac rehabilitation exercise in both the home and the remote hospital setting.	Monitoring of specific cardiac diagnoses	n=67; f=16; m=51; all patients have coronary artery disease; specific cardiac diagnoses are provided in the article for all patients n=30 exercised at home n=37 exercised at the local hospital	1865 transtelephonic ECG monitored exercise sessions for 67 cardiac patients were monitored by telephone with a single lead electrocardiogram and 2-way on-demand voice communication Exercise duration 30-50 minutes per session; 1-3 monitored sessions per week	not reported	Most patients attained their target heart rates during monitored exercise sessions No problems with patient scheduling or compliance were identified Use of transtelephonic monitoring of cardiac exercise session in the remote hospital setting is attractive for several reasons including -patient safety and confidence during exercise is enhanced by the availability of trained medical personnel on site -remote facility does not need to purchase relatively costly EC monitoring equipment for its cardiac rehab program -staff time at the remote hospital is minimal for the program to function -not all patients can travel to a rehab centre

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APPENDIX M: CRITIQUE TELEREHABILITATION

Author/ Article Title / Year/ Country / Location	**Purpose/ Objectives**	**Design**	**Analysis**	**Participants: age/ gender/ groups**	**Intervention/ Duration**	**Follow-up: sample size; dropout**	**Outcomes/ Socio-Economic Indicators**
Stern H, Jeaco S, Millar T. Computers in neurorehabilitation: what role do they play? Part 1. British Journal of Occupational Therapy 1999; 62(12):549-553. **UK**	Assess role computers play in neurorehabilitation.	Descriptive Study (XIII) SoE: Poor	Regional Rehabilitation Unit (RRU) carried out a computer assessment which looked at seven main areas of potential issues that are evaluated and with continuous monitoring can be addressed at any stage of therapy: communication, motor skills, cognitive functions, social skills, mood, computers for work, computers for leisure	Examination of previous study; No participants for present study. 63 patients participated in cited study	None	None	Computers have an important role to play in the treatment of people with neurological disabilities Many patients are able to acquire useful word processing skills

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APPENDIX M: CRITIQUE TELEREHABILITATION

Author/ Article Title / Year/ Country / Location	Purpose/ Objectives	Design	Analysis	Participants: age/ gender/ groups	Intervention/ Duration	Follow-up: sample size; dropout	Outcomes/ Socio-Economic Indicators
Vesmarovich S, Walker T, Hauber RP, Temkin A, Burns R. Use of telerehabilitation to manage pressure ulcers in persons with spinal cord injuries. Adv Wound Care 1999; 12(5):264-269. **USA** Shepherd Centre, Atlanta	To determine whether wound care via videoconferencing was a viable alternative to clinic visits for those persons with spinal cord injuries (SCI) with pressure ulcers	Non-controlled clinical series (XIII) SoE: Poor Informal telephone interviews re. satisfaction	None	Voluntary participation; recruitment by nurse SCI patients n=8 males; 2 african american; 6 Caucasian Aged 38-78 mean age 49.8 years	Telerehabilitation "visits" scheduled weekly; participants seen average of 7 times with range from 1 to 18 "visits"	n=8 originally participated in the study 1 dropped out, so final number of participants who completed the study was 7	12 pressure ulcers treated among 8 participants PU management can be carried out via telerehab 7 of the sites via telerehab healed completely Patients appreciated savings in time & money associated with transportation costs and had a high degree of satisfaction with the system

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APPENDIX M: CRITIQUE TELEREHABILITATION

Author/ Article Title / Year/ Country / Location	Purpose/ Objectives	Design	Analysis	Participants: age/ gender/ groups	Intervention/ Duration	Follow-up: sample size; dropout	Outcomes/ Socio-Economic Indicators
Zwolan TA, Connor CM, Kileny PR. Evaluation of the Foundations in Speech Perception software as a hearing rehabilitation tool for use at home. Journal of the Academy of Rehabilitative Audiology 2000; 33:39-51. **USA** Michigan	Evaluation of Foundations in Speech Perception (FSP) software Done on children with cochlear implants	Non-randomized prospective controlled trial (IV) SoE: Good-fair Pre-study and Post-study scores	Treatment group uses FSP in home; control group does not ANOVA and MANOVA Questionnaire provided to parents	14 children aged 5-12 years Matched for age, onset of deafness etc. in each group Demographic info provided	Treatment group uses FSP in home daily for six months Treatment and control groups tested pre and post 4 tests: - Minimal Pairs test - Northwestern University Children's Perception of Speech Test (NUChips) - Phonetically Balanced Kindergarten test (PBK-50) - Percentage Consonant Correct (PCC)	14 children participated in the study for the duration of the study	Use of the FSP program facilitated improved speech perception and speech production skills over 6 month period. Scores obtained by the intervention group were significantly greater than controls for 2 tests of speech recognition: PBK-50 ($p < .05$) and NUChips ($p < .05$). Q'aire provided to parents indicated high satisfaction level with FSP software Additional research required on whether the improvements made by the children were sustained after the end of the study

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Methodological Problems	Policy Recommendations
Lack of a nonexercise control group.	Online monitoring extends rehab benefits to high risk patients who are isolated from the cardiac rehab facility

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Methodological Problems	Policy Recommendations

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APPENDIX M: CRITIQUE TELEREHABILITATION

Methodological Problems	Policy Recommendations
	Telehealth implementation to increase access to health services for secondary prevention is challenging and requires further exploration.

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Methodological Problems	**Policy Recommendations**
Exclusions? Patients who didn't own a computer? Number of participants in each group?	Internet based programming shows a potential for impacting rural patients with IHD

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APPENDIX M: CRITIQUE TELEREHABILITATION

Methodological Problems	Policy Recommendations
	Funding one of the greatest obstacles to this aspect of telerehabilitation

Note: Abbreviations used in this document are described in Appendix D

APPENDIX M: CRITIQUE TELEREHABILITATION

Methodological Problems	**Policy Recommendations**
No study conducted	Possible implications for rehab using integrated home systems include: -increased potential for independent living through full control of the home environment -extending the time people with a degenerative condition are able to remain in their homes -remote health monitoring Being dependent on computers may lead to social isolation if carers no longer present, but could also increase mobility of the individual so they may have greater independence outside the home which could reduce isolation

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APPENDIX M: CRITIQUE TELEREHABILITATION

Methodological Problems	Policy Recommendations
Only verbal consent given; may indicate the possibility of ethical problems Small sample size Hearing and visual deficits constituted communication barrier for some elderly patients	Teleconsulting between orthopedic surgeons and elderly patients possible provided certain technical, clinical, and psychological considerations addressed
Small n	Requirement of high quality cameras Lack of palpation represents a major limitation to remote wound assessment and to making accurate therapeutic recommendations

Note: Abbreviations used in this document are described in Appendix D

APPENDIX M: CRITIQUE TELEREHABILITATION

Methodological Problems	**Policy Recommendations**
Various problems with telerehab discussed	Need further studies of cost-effectiveness for telerehab; it is a challenge to fund these services through traditional reimbursement sources Future research must focus on expanding the applications of this technology along the continuum of care for SCI and on proving the cost-effectiveness of these applications Does offer promise for long-term services and support needed by individuals with SCI
Study provides results for only one individual No mention of other studies on videoconferencing in assisting other isolated doctors/therapists etc.	Attempt to establish centre of telehealth for individual continuing education and technical support for health-care professionals, especially rural

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APPENDIX M: CRITIQUE TELEREHABILITATION

Methodological Problems	Policy Recommendations
time consuming to work with computer assisted cognitive rehab; more time needed Demands placed on selection of participants	Supervisors of such projects require specialized knowledge; require colleagues to discuss with This form of rehab is demanding in cost and resources Research needed to establish whether cognitive training with computers is worth the time and resources for the benefit achieved

Note: Abbreviations used in this document are described in Appendix D

Methodological Problems	**Policy Recommendations**
Article cites research is needed to examine more roles that telemedicine may play in the provision of vocational rehab services	If developed further, would provide quality rehab services in an effort to afford greater vocational and self independence. Issues of confidentiality should be addressed including access to networks, quality of transmission, storage and retrieval of data Further research needed to examine more roles ie.vocational evaluation and job analysis, that telemedicine may play in the provision of vocational rehab services
Single case study does not allow for generalizations Patient very familiar with computer equipment	Problems with cost effectiveness Telemedicine as a means to deliver rehab services for the detection, prevention, and treatment of pressure ulcers to people with SCI's useful

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APPENDIX M: CRITIQUE TELEREHABILITATION

Methodological Problems	Policy Recommendations
Larger sample required for more comprehensive analysis	Need to explore how telehealth leads to better community reintegration and adjustment by promoting self-efficacy among SCI patients Training patients on how to use equipment prior to discharge would be helpful, and less costly for technicians to travel to patients homes to set up equipment.

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Methodological Problems	Policy Recommendations
Some problems reported with relation to medication management, equipment, skin and safety No control group	Diagnosing skin conditions through verbal description alone not reliable, thus video based interventions are an effective way to assist patients and provide them with education.

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APPENDIX M: CRITIQUE TELEREHABILITATION

Methodological Problems	Policy Recommendations
Findings must be viewed as preliminary as for the results presented ere, only 42% had been enrolled for one year -While the study population in terms of demographics was similar to the national spinal cord population, it should be noted that all recruits came from a single rehab facility with its specific care practices	-Telehealth approaches facilitate ongoing education required by people with spinal cord injury -Telehealth interventions facilitate the identification of issues such as substance abuse & provide follow-up care so the chance of problem identification can be improved -Travel time lessened -In home telephone or video based interventions do improve health related outcomes for newly injured SCI patients
No study conducted	

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Methodological Problems	Policy Recommendations
In psychotherapy study, patients received both in person and videoconf but assessment study received only video conf	TM assessment services may be more acceptable to patients then psychotherapy, especially in settings in which it provides access to care rather than supplementing in-person services. Training for rural clinicians means they can treat brain injury issues locally and leave emergency problems for specialists TM training programs can help rural regions develop permanent infrastructure of clinicians with enhanced competencies.

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APPENDIX M: CRITIQUE TELEREHABILITATION

Methodological Problems	**Policy Recommendations**
Small sample size Lack of non-exercise control group Exercise only study without measurement of coronary risk factors	Advantages of TEM: -the patient unable to return to a hospital based program can still receive supervised rehab -patients can exercise in familiar surroundings -fewer transportation and scheduling problems -convenience Disadvantages of TEM -immediate medical attention unavailable -education classes more difficult to conduct via telephone -interaction with multidisciplinary team impossible -patient interaction limited TEM should not be considered as a replacement for the hospital based program

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Methodological Problems	**Policy Recommendations**
No comparison to traditional method, i.e., not long distance monitoring Number of male patients far exceed female patients; no comparison between women and men Various rehab start times No comparison of at home and in hospital TEM monitoring	trans. Monitoring appears safe and feasible for routine clinical use; good alternative to traditional cardiac rehab. programs

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Methodological Problems	Policy Recommendations
Researchers did not measure whether the patients' functioning was improved by computer use.	Occupational therapists need to be confident in the use of computers and understand their potential for patients

Note: Abbreviations used in this document are described in Appendix D

Methodological Problems	Policy Recommendations
No women included in study Voluntary participation through recruitment problematic Small sample size No analysis detailed	

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APPENDIX M: CRITIQUE TELEREHABILITATION

Methodological Problems	Policy Recommendations
small sample size	In order to optimize performance with a sensory device, especially in children, rehab efforts should be supplemented by some form of home therapy

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APPENDIX N: CRITIQUE REVIEWS

Author / Article Title / Year / Country / Location	Purpose / Objectives	Design	Analysis	Participants: age / gender / groups	Intervention / Duration	Follow-up: sample size; dropout	Outcomes / Socio-Economic Indicators
Currell R, Urquhart C, Wainwright P, Lewis R. Telemedicine versus face to face patient care: effects on professional practice and health care outcomes (Cochrane Review). In: The Cochrane Library, Issue 2; 2002. Oxford. UK	To assess the effects of telemedicine as an alternative to face-to-face patient care.	Review Study (7 studies; all randomized controlled trials)	Objective measures of provider performance or patient outcome. Data summarized & presented in natural units	Qualified health care practitioners Patients receiving care from any qualified hc practitioner through the medium of telemedicine compared to those receiving equivalent face-to-face care	5 concerned with use of telecommunications to support care of homecare or patient self-monitoring of chronic disease e.g., POTS; using monitors for heart rate, ECG, blood glucose levels. 2 involved GP's &Emergency/OPD Dept consults	Sample sizes small Groups well matched Drop-out rates not reported but comment on initial eligibility & dropping out over time.	Few significant differences between groups e.g., little evidence of clinical benefits. Significant improvement in medication adherence in non-adherent patients. Significant within-group improvements in physiological measures after cardiac exercise program. Trend toward higher level of satisfaction in intervention group. No data to support changes in physician behaviour. Experimental group motivated by regular contact with hcp's. Transfer of skills between clinicians not addressed. Feasible to use telemedicine systems. No detrimental effects reported.

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Hersh, WR, Helfand, M, Wallace J, Kraemer D, Patterson P, Shapiro S, Greenlick M. Clinical outcomes resulting from telemedicine interventions: a systematic review. BMC Medical Informatics and Decision Making, 2001 (1)5 USA (Referenced 1 study in Japan)	Evaluate the efficacy of telemedicine interventions for health outcomes in two classes of application: home-based and office/ hospital-based	Review Study(25 articles) Merges results from original two reports for US federal agencies, HCFA & AHRQ))	Summary statistics extracted from each article. Stated that Scale developed by their evidence-based practice centre used to assess study quality & Second scale used to indicate direction of the evidence.	Diabetes: children; adults; gestational. CDM: elderly Hypertension:Elderly & pregnant women AIDS: ? Other Areas: Alzheimer's; Cardiac exercise; Families of children in NICU; Ped home ventilator patients Office/Hospital:?	Glycemic control; ER visits; psychological status; family fx. Plus tracking HgbA1C value Usual home help +Video system /videophone for remote, real-time interaction Computer-controlled, automated telephone system; medication adherence & B/P monitoring Home computer link to information, peers & HCP Home computer link for care givers; Transtelephonic exercise monitoring Internet based TM program for families; Videophones to HCP's Outcomes e.g., f/u care; return to ER; need for f/u app't with Specialist Durations not identified in any studies	Made reference to small sample sizes. No reference to drop-out rate.	Small amount of evidence that interventions via telemedicine result in outcomes comparable or better than face-to-face care. Best evidence in home-based TM – modest benefits for CDM, AIDS, Alzheimer's. Benefits were non-conclusive for monitoring blood sugar. Good evidence for comparable care in ER settings & benefit in surgical & NICU. Probable benefit for dx capability for teledermatology

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Balas A, Jaffrey F, Kuperman G, Austin Boren S, Brown G, LEE FP, Mitchell J. Electronic Communication With Patients: Evaluation of Distance Medicine Technology; JAMA 278(2):152-159, 1997. USA	To evaluate controlled evidence on the efficacy of distance medicine technologies in clinical practice and health care outcome.	Review Study (80 clinical trials)	Validated clinical trial scoring system applied to each study to assess methodologic quality.	Age range from newborn to elderly. Multiple groups including: Diabetes, ER Visits, Cardiac Care, Mammography, Osteoarthritis, Tobacco Use Prevention, Appointment keeping rates, Immunization rates Medication compliance, Diabetic foot care	Distance medicine interventions were grouped into 6 categories: 1) computerized communication, 2) telephone f/u care, 3) telephone reminders, 4) interactive telephone systems (POTS), 5) telephone access to physician, 6) telephone screening Each study is outlined in table format under headings: Quality score, Sample, Intervention, & Effects. Duration nor drop-out rates reported.	Sample size range from 20 to 2668.	Telephone f/u and reminders appear to be the 2 most prominent strategies being researched (at this time). 61 analyzed provider-initiated communication with patients; 50 reported positive outcome, improved performance or significant benefits. Significantly improved outcomes in studies of: Preventive care, Osteoarthritis, Cardiac rehab & Diabetes Found distance medicine technology enabled greater continuity of care by improving access & supporting coordination of activities by clinician – physician & others

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Cost:Benefit							
Whitten P, Mair F, Haycox A, May C, Williams T & Hellmich S. Systematic review of cost effectiveness studies of telemedicine interventions. BMJ, 15 June 2002, 324, 1434-1436 UK (Authors USA & UK) USA (33) Norway (7) Remainder: Australia Canada Rest of Europe & Japan	To systematically review cost benefit studies of telemedicine; to address the question of whether the existing literature allows any conclusions to be drawn about the cost effectiveness of telemedicine interventions. Note: TM is defined here as clinical practice for diagnosis, review, or management undertaken synchronously or asynchronously through the medium of information & telecommunications technologies (fax & phone excluded).	Review Study (612 studies identified; 557 without cost data; 55 with cost data; 24 subjected to full review after applying checklist).	Used checklist of criteria to assess CE studies. Divided studies into those with & those without data. Studies without data were thematically categoried to determine main premise for each study. For articles with data, a data extraction instrument was devised and used to code each aspect of the study i.e., Location; type of service/ delivery/ facility; Duration; # of patients; Consultations; Images transmitted; Cost revenue variables; Study conclusions. Applied inclusion & exclusion criteria to select articles for full review. Used qualitative analysis of studies with cost data rather than meta-analysis due to wide variation in study design, context, patient groups & types of analyses.	Not reported other than 'varied'	Referred to as data collected for each study; noted that most were 'short term'.	Noted that sample sizes in most studies were small.	Only 9% of 600 studies identified contained any cost benefit data. Only 4% of those articles met quality criteria justifying inclusion in a formalized quality review & most were small, short term, pragmatic evaluations with few generalizable conclusions. There is little published evidence to confirm whether or not TM is a CE alternative to standard health care delivery.

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Hailey D, Roine R, Ohinmaa A. Systematic review of evidence for the benefits of telemedicine. Journal of Telemedicine & Telecare, 2002, 8(Suppl 1), S1:1-7 International (Authors from Canada & Finland) USA (33) UK (9) Canada (4) Finland (4) Norway (4) France (3) Australia (2) Austria (1) Germany (1) Greece (1) Hong Kong (1) Italy (1) New Zealand (1) Group of four European countries (1)	To provide an overview of the evidence of reasonable quality on the efficacy, effectiveness & economic effect of telemedicine applications, as a guide to decision makers in health care and others. [Combines 2 systematic reviews: 1) 1997: International Network of Agencies for Health Technology Assessment (INAHTA); covering 1966-Nov 1998. 2) Nov 1998- Dec 2000 & Includes further analysis of selected studies; their limitations & potential influence on future decisions regarding TM applications]	Review Study (64/1323 + 2 from AHFMR; focus on studies reporting outcomes compared with non-TM alternatives). Category (c) of Jovell & Navarro-Rubio: RCT's (11- c. II & III); Clinical/ Admin outcomes: 6-c. IV or V; 17, c. VI; 5, c. VII; 11, c. VIII Classification of studies that evaluated TM applications are cited/ analyzed in the appendix.	5 step screening process plus applied 9-level classification of Jovell & Navarro-Rubio to study design. Also considered: Objectives; Approach; Setting; Subjects; Type of economic analysis; Results; Conclusions. Also noted: Limitations & Way they were reported. Attempted to judge potential influence on future decisions about TM applications.	Participants varied across disciplines dependent upon studies used as examples. 59 TM programs were covered by the 66 papers; grouped by 11 areas of application Settings: Hospital/ Outreach Clinic/ Health Centre (32); Major & smaller hospital (14); Home Care & hospital or clinic (13); Major hospital & major hospital (4); Clinic & Consultant (3)	Focus on clinical interventions. Reported most to be pilots with short-term outcomes; few considered long-term or routine use.	Not reported.	Results of review indicate little good quality information on the efficacy, effectiveness & CE of TM; generalizability of most assessment findings are limited. Most articles were reports on feasibility of various applications; only 5% reported comparative studies. Most evidence of efficacy & efficiency in: Radiology (neuro); Telemental Health; ECG transmission; Teledermatology; Home telecare; & Some medical consults. Teleradiology (especially CT) can be cost saving Positive emerging trend toward increase in # of reasonable-quality studies addressing comparative outcomes; economic evaluation is starting.

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Roine R, Ohinmaa A, Hailey D. Assessing telemedicine: a systematic review of the literature. CMAJ-JAMC, 2001, 165(6): 765. [Tables not available to reviewer] Canada (authors from Finland & Canada)	To clarify the current status of TM through a systematic review of the literature; to assess the quality of the literature that reported patient outcomes, administrative changes or economic assessments.	Review Study (1124 identified; 50 included) Clinical Outcome assessment 34; Economic Analyses 16.	Applied inclusion and exclusion criteria to articles using a multi-step screening process. Strength of evidence (other than economic analyses) was judged according to a 9 level classification system by Jovell & Navarro-Rubino to specify study design in descending order of strength and then further qualified by conditions of scientific rigor for the study.	Participants: Various medical consultation - 14; Patient monitoring or counseling - 7; Teleradiolgy - 7; Emergency; Psychiatry; Dermatology; Cardiology; Ophthalmology; Pathology Age groups not reported.	POTS for diabetes management and blood pressure control. Real time V/C Teleradiology (neurosurgical patients)	Not reported.	Evidence regarding effectiveness or cost-effectiveness is still limited. Based on evidence, only a few TM applications can be recommended for broader use i.e.,: Teleradiology; Teleneurosurgery; Telepsychiatry; Transmission of ECG images & Use of electronic referrals enabling e-mail consults & V/C between primary & secondary HCP's. Economic analyses suggests Teleradiology can be cost saving; especially transmission of CT images. Cautioned against generalizability of the findings.

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Hakansson S & Gavelin C. What do we really know about the cost-effectiveness of telemedicine?. Journal of Telemedicine and Telecare; 2000, 6(Suppl 1). Sweden Studies from: USA (19) Norway (4) UK (2) Australia (1) Canada (1) Austria (1) Germany (1)	The purpose of this study was to update the knowledge about the cost-effectiveness of TM for the Swedish Institute for Health Services Development in Stockholm, Sweden.	Review Study(246 of 1500 articles)	Not described. Appears to be summarization of costing data described in individual papers.	Not reported	Duration not reported. Comment regarding many of the studies being confined to research projects that were publicly funded & feasibility studies. Referenced limitation regarding length of study period.	Not reported. Reference made limitations in respect to sample size	Identified multiple definitions of TM to affect meaning of 'cost-effectiveness' & other such issues. Focused on 'break-even' stats; noting them to be very program and county dependent. Literature reflects past, not current, activity & information. Difficult to evaluate TM e.g., evolving technology; multiple applications; joint cost; ? appropriateness of conventional economic evaluation techniques
Mair F & Whitten P. Systematic review of studies of patient satisfaction with telemedicine. BMJ, (320) 3 June 2000. UK (7) but studies also from: Australia (4) Canada (2) France (1) Israel (1) Japan (1) Norway (1) USA (15)	To review research into patient satisfaction with teleconsultation, specifically clinical consultations between healthcare providers and patients involving real time interactive video.	Review Study. 32 studies: RCT's, random patient selection, case-control, selection criteria not specified or participants represented consecutive referrals, convenience samples or volunteers	Broad qualitative review of the data, including a critical review of the strength of the findings. Judged reliability & validity of data by individual study methodology & generalizability from study context. For critical appraisal used a checklist designed for assessing methodological quality of randomized & non-randomized studies of health care interventions	HCP's from any discipline & Patients	Included only Clinical Trials that explored patient satisfaction with teleconsultation; specifically clinical consultations between HCP's from any discipline and patients involving use of Real time interactive video	Sample sizes ranged from # 20 (10 trials), # 100 (14), $ 100 (7) not specified (1)	Study suggests teleconsultation is acceptable to patients in a variety of applications. Most studies had a technological focus. Review demonstrates methodological deficiencies in published research affect the validity & generalizability of the results & that communication issues, quality of interpersonal relationships with TM have to be more fully explored.

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Williams T, May C, Esmail A. Limitations of patient satisfaction: studies in telehealthcare.Telemedicine Journal and e-Health; 2001 7(4), 293-303. UK (17%) USA (44%) Canada (11%) Scandinavia (10%) Australia (5%)	To provide a systematic review of studies on patient satisfaction with telemedicine & to assist in providing direction for progression of research in this field.	Review Study (125 papers identified; 93 included) Real-time V/C 71%; V/C + other systems 17%; S/F only 7%; Telephone only 2%	A structured coding form was developed for the review using a list of aspects of satisfaction drawn from the general literature on patient satisfaction research & adapted to reflect unique characteristics of TM. A data extraction instrument was developed using pre-testing/ reliability testing to extract characteristics of study design.	Participants: Telepsychiatry /Telepsychology 25%; Multi-specialty studies 14%; Nursing 11%; Dermatology 8%; General Consultation 4%; Surgery 4%; Orthopedics 4%; Oncology 3%; ENT 3%; Ophthalmology 3%; Neurology 3% Age not reported	Not reported.	Sample size ranged from 3 to 657 patients; median = 30. (exception: 1 study of 4696 users of a telephone based nursing study)	Evidence of patient satisfaction with TM is limited; mostly pilot projects & feasibility studies. Noted that many responses were by patients who received TM in addition to standard health care &, therefore, are not generalizable to situations where TM may become the standard for healthcare delivery. Reported levels of satisfaction with TM are consistently > 80%; frequently reported 100%.

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Miller E. Telemedicine and doctor-patient communication: an analytical survey of the literature. Journal of Telemedicine and Telecare, 2001 6: 1-17 USA (21) UK (6) Australia (4) Norway (3) Canada (2) Finland (1) Sweden (1)	To review the literature about the effect of TM on doctor-patient communication.	Review Study (38/140 articles included) 3 basic types of studies were identified: 1.encounter surveys of provider & community attitudes (6) 2.post-encounter surveys of participants in a medical consultation (21) 3.qualitative analyses of medical encounters including participant & non-participant observation, in-depth interviews, case reports, archived resources & content analysis (11)	Grouped articles into 23 categories; then a (+) or (-) rating was assigned to each result, where possible, based on pre-determined criteria. Described each study by author, location, TM experience, methods, communication / other findings.	Participants: Physician Specialist mostly in urban areas; patients & referring providers located in a variety of remote sites (rural & suburban hospitals & clinics, physicians offices & 1 in a prison). Age groups not reported.	Range of 1 day to 1 year or more.	Range of Attitude surveys 27 – 461 (50%<30); Range of Post encounter surveys 21-495 (66%> 50); Range of Qualitative studies 1-28. Participation rate (of those reported)>50% Drop out rate not reported.	(+) results approx 3 times > (-) results. Categories with at least 8 more (+) than ( ) results: General communicative efficacy; Patient/provider comfort; Patient/provider relations; Anxiety/nervous; Misc. affect; Audio quality; Video quality. Categories with greater (-) than (+) findings were: Non-verbal behaviour & Lack of touch. Review strongly favors doctor-patient communication via TM.

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Rural & Remote							
Mair F, Haycox A, May C, Williams T. A review of telemedicine cost-effectiveness studies. Journal of Telemedicine and Telecare; 2000, 6(Suppl 1), 2000. UK	To examine the published evidence regarding the cost-effectiveness of telemedicine to determine whether, on the basis of available evidence, widespread implementation of telemedicine services appears supportable.	Review Study (numbers not reported; only used papers describing original research about TM in provision of direct patient care, and published in peer reviewed journals)	Used a checklist developed by the authors (originally to assess the value of pharmaco-economic studies) that outlined attributes and standard that should be exhibited in good studies to evaluate quality of methodology and reliability.	Not reported	Not reported	Not reported	Found existing literature to be limited and methodology, generally, to be seriously flawed & to focus on the question "Can we do this?"

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Wootton R. telemedicine and developing countries: successful implementation will require a shared approach. Journal of Telemedicine and Telecare 2001, 7(Suppl 1), 51:1-6. Australia	To describe what is known about the use of TM in the developing world.	Review Study (39 articles identified in database search; 16 about clinical from personal knowledge of non-Medline indexed articles) Combined with Opinion Study	Classified in categories of: Clinical 5%; Feasibility 5%; Non-peer reviewed 26%; Not relevant 13%; Opinion/Comment 10%; Review articles 41%. Noted most articles are reviews or editorials. No analysis methodology provided.	Focused on providing TM to 3rd World Countries Age not discussed.	Focus on low cost clinical TM using e-mail & digital cameras for education, clinical & administrative purposes. Noted the SatelLife operation on the Internet & cited the need (and beginning steps for publishers) to share information; e.g.: guidelines for TM through the web.	Not reported.	Published literature shows that TM for the developing world is at a very early stage. Majority of TM is education; limited clinical experience. One 1-year program evaluation found advice provided to referring doctor to be clinically useful & cost-effective but questions ability to be sustainable & provide quality control. Use the guiding principle 'to be clear about what problem you are trying to solve'. Cites moral responsibility to ensure that TM is properly tested and evaluated if belief is that it has the potential to improve healthcare; especially in the developing world; i.e.: the only way to make rational decisions about the use of scarce resources.
Campbell N, Ritchie L, Cassidy J & Little J. Systematic review of cancer treatment programmes in remote and rural areas. British Journal of Cancer, 1999, 80(8) 1275-1280. UK (1) USA (12 papers on 9 programs) Australia (2)	To review the literature about programs providing cancer treatment in remote and rural areas and to identify evidence of effectiveness and problems. (Written as a first step in a Cancer Research Campaign funded project on treatment of cancer in rural areas.)	Review Study (15 studies reporting on 12 programs; all small; 2 non-randomized controlled; 2 before/after uncontrolled studies; 10 cross-sectional)	Divided into 4 groups: Initiatives based at rural hospitals; Shared care programs; Outreach Programs; &Teleoncology. Each described in table format under headings Author; Place; Aims of paper as stated in intro/abstract; Type of Program; Type of Eval; Eval Outcomes; & Numbers & Response Rate	Participants: GP's; Specialists; Patients with a variety of types of cancer; Community Nurse. Age not specifically stated but 2 studies referred to programs for children.	Duration not reported.	Not reported. Comment that as there was only 1 paper from the UK that relevance was limited and indirect due to variation in rural settings & dissimilarities among countries.	Confirmed the paucity of research in rural areas. Rural hospitals – performed poorly; unlikely to improve unless local physician(s) have specific interest; Shared care – some evidence for a shared approach between specialist & local practitioners may be the way forward. Outreach Programs - least economically attractive (6fold increase in cost/ visit; could only be justified if significant patient benefit); & Tele-oncology - cheaper than Outreach Clinics but at least double the cost of central clinics; more evidence needed on acceptability & patient outcomes.

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Grigsby J, Kaehny M, Sandberg E, Schlenker R, Shaughnessy P. Effects and effectivenss of telemedicine. (Access to Health Care Services in Rural Areas: Delivery & Financing Issues). Fall 1995. Health Care Financing Review, 17(1): 115-127. USA	To review the literature [30 years] on the effects and medical effectiveness of TM. Limit scope of article to issues of cost, CE, effects on patient management & acceptability to providers & patients. Therefore, did not review recent papers addressing policy & conceptual issues e.g., confidentiality, licensure, payment, role of TM within the medical information infrastructure.	Review Study.	Cite literature review to cover ' nearly all of the literature' but does not cite # of articles. Do comment on making the assumption that a paper having been peer-reviewed insured some minimal standard & be found in scientific & professional journals but found most TM research in technical reports or conference proceedings – informal & with little rigor.	None – Literature review but referred to: Neurology, Cardiology, Dermatology, Psychiatry, ENT, Fetal U/S, Trauma & Disaster Medicine, Home Health Care	Focus on TM services not covered, implicitly or explicitly, by Medicare i.e., services when provided by conventional means require the presence of a patient.	Low patient volumes reported & small number of programs.	Found there is little good SR although there are many reports suggesting the feasibility of a range of applications and approaches/ technologies but with no replications or cross-validation studies. Impediments to full deployment of TM categorized as: -Technology or TC infrastructure; -Human or Organizational Infrastructure; -Health Care Financing Infrastructure Know very little about the costs, effects & effectiveness of TM but private sector is actively progressing. Extent Medicare should be involved remains unclear.

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Mental Health							
Baer L, Elford R, Cukor P. Telepsychiatry at Forty: What Have We Learned? Harvard Review Psychiatry, May/June 1997 (5)1 USA / Canada	To examine all articles describing video applications of telepsychiatry published in peer reviewed journals to gain a historical perspective of its use over the past forty years; hence to determine the lessons learned.	Review Study (21 Studies) 3 reports of video to CE; 8 uncontrolled studies or anecdotal clinical assessment/ consultation, 5 clinical investigations 3 evaluation & 2 on cost-effectiveness	Each peer reviewed journal article is listed and described via: Study, Year, Application, Equipment/ comparison, Population & Location. Categories are: V/C for CME; Clinical psych v/c – no controls; Clinical psych v/c –with control group or condition; Reliability of psychometric assessment conducted by video; Cost effectiveness of video consultation.	Medical, nursing and PhD students; Psychiatrists; Mentally retarded adults; Adult and Child Psychiatric in-patients; Adult and Child Psychiatric out-patients; Prisoners; Inner city children & mothers.	Historical over a period of 40 years.	Small sample size is referenced but size of specific groups is not stated	Telepsychiatry is feasible & well accepted by the majority of patients & doctors but rated inferior to face-to-face consult. Evidence is insufficient to recommend widespread implementation of telepsychiatry. The effects of TM on cost, quality & accessibility are noted to be interconnected & that a comprehensive assessment must include the 3 aspects; each considered from the client, provider & societal perspectives.

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Other							
Hersh WR, Wallace JA, Patterson PK, et al: Telemedicine for the Medicare Population: Pediatric, obstetric and clinician-indirect home interventions. Evidence Report/Technology Assessment No 24, Supplement. AHRQ (US) Publication No 01-E060, August, 2001	Extension of previous report on efficacy of TM by assessing pediatric and obstetric populations along with home TM where HCP involved in indirect manner. Focused on S/F, self-monitoring and V/C	Literature review - 40 references	Papers selected if addressed one of the designated patient populations, was relevant to at least one of the study areas, addressed at least one key question and contained results. Articles categorized by key questions addressed: Dx/management, access, outcomes, satisfaction or cost. Of 1186 references only 46 met criteria for inclusion	3 patient populations: pediatrics, obstetrics, home care with HCP involved indirectly	None - literature review	46 articles met inclusion criteria Few studies in S/F	Evidence that diagnosis and clinical management improved by S/F in pediatric dental screening, ophthalmology and neonatalogy. In self-monitoring access to care is improved. Clinical outcome improved for clinician-indirect home TM for patients with HIV and Alzheimers. No clear definition of which technologies provide benefit or CE Access to care improved 3 cost studies failed to demonstrate
Ball C, McLaren P: The teleassessment of cognitive state: a review. J Telemed & Telecare 3: 126-131, 1997	To assess the use of the telephone and V/C to conduct cognitive testing.	Literature review 13 POTS based studies, 2 V/C 28 references	Summary of findings from selected papers	15 studies reviewed but number of participants in each quoted in only 3 cases - 25, 96 and 67 Most studies focused on elderly patients likely to be suffering from dementia.	Variety of tests adopted by various authors each with the intent of measuring cognitive state in reliable manner	Small sample sizes or not stated.	Concluded that POTS has much to offer but choice of test must be made with clear view of what assessment is to be conducted.

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Other Literature Reviews (Not Systematic Reviews)							
Hailey D & Crowe B. Assessing the Economic Impact of Telemedicine. Dis Manage Health Outcomes Apr 2000 7(4), 187-191. Canada & Australia	To review the current analyses of the economic impact of TM as part of the validation process to determine if the hopes for this group of technologies to lead to cost and administrative efficiencies by reducing the time needed to perform various tasks and facilitating increased access to services with the expectation of improved health status still require validation.	Study Review (20 articles on assessment)	Not reported	Not reported	Areas of economic impact: Equipment & Infrastructure; Organizational & health services issues & Influence on health status & outcomes. Approaches to assessment should include: Technical; Clinical; Economic; Social & Organizational issues to provide a broad description of TM for decision makers.	Not reported	Overall effect of TM on long term impact of health status, costs & organization is still far from clear as most studies report on pilots or feasibility projects; few peer reviewed studies. Economic assessment constrained by: Few published studies in peer reviewed journals &, in practice by: Availability of data; Timing of policy & admin decisions & Inertia in health care system. Findings not generalizable. Research methodologies appropriate to specific issues & outcomes described.

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Taylor P. A survey of research in telemedicine. 1. Telemedicine systems. Journal of Telemedicine & Telecare, 1998; 4: 1-17 UK	To highlight some of the more interesting & problematic the safety and efficacy of telemedicine systems; focus on quality of research in TM & assessment of scientific merit; specifically on digital images. Telemedicine Systems: "research into TM systems tests the capabilities & requirements of TM technologies".	Review Study (noted proliferation of articles published since 1997)	Safety & efficacy best tested by performing laboratory experiments in controlled settings to allow strict comparisons between different conditions. Analyzed by applying four elements common to most evaluations of image quality in TM (cited in Scott et al) i.e., Case selection; Case interpretation; Gold Standard; Deriving indices of diagnostic accuracy. 33 studies comparing dx performance using digital & conventional radiographs described under headings: First Author; Sample; Study & Control conditions; Gold Standard; Technical Info; Statistical analysis; Conclusion.	Not reported	Tests of radiology systems focused on pixel size and resolution in attempt to determine acceptable specification for TM system. Duration not reported.	Range of # of radiographs: 20-2688 studied for resolution quality. 20-100 = 11 100-200 = 11 200-300 =4 300-400 = 2 685 = 1 812 = 1 897 = 1 968 = 1 2688 =1	2048 pixel displays cannot adequately detect subtle kinds of abnormalities but may be adequate based on findings that differences of dx between TM & conventional radiology are relatively low. Relatively little has been done to assess diagnostic accuracy of TM Noted that imaging systems with better technical specifications are not guaranteed to improve performance of clinicians. Tests in this study were classed as lab tests of technical effects & impact on dx performance of TM systems only.

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APPENDIX N: CRITIQUE REVIEWS

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Taylor P. A survey of research in telemedicine. 2. Telemedicine services. Journal of Telemedicine & Telecare, 1998; 4: 63-71 UK	To highlight the utility & effectiveness telemedicine services. Telemedicine services: "research into TM Services examines the effectiveness of care delivery employing the technology".	Review Study (noted literature on TM expanding at an extraordinary rate)	Analyzed according to Friedman's 4-layered model of creative work people do in medical informatics i.e.: 1. Formulating Models 2. Developing systems (omitted as concentrated on in first article) 3. Installing systems & 4. Studying effects of the systems. Assessment of effects of TM services described in 3 categories: - User satisfaction - Medical outcome - Financial benefit (Could add equality of access to care)	Not specifically reported; referred to a number of clinical services and users e.g., Dermatology Outreach clinics Specialists GP's Nursing homes Prisons Renal dialysis Centres Teleoncology	TM Services described in 3 broad categories: 1. Treatment 2. Diagnostic or management & 3. Information or educational.	Not reported. Referred to small pilot studies.	Research on TM services is very heterogeneous. Most work on TM services published as short accounts of pilot projects; present preliminary results but are inconclusive & most fail to describe lessons learned. Identification of careful work that does show TM to provide benefits in certain situations. Suggest that (+) conclusions about US drawn from pilot studies may exaggerate the degree of acceptance of a routine service. Small amount of data for medical outcomes for TM but appears to be clear benefit for: 1)Transmission of scans for intra-cranial injuries & 2)Telephone monitoring devices to support CDM. Studies on cost are few & are inconclusive; may be situation dependent &/or off-set by benefits
Loane M, Wootton R. A review of telehealth. In: Medical Principles and Practice 2001; 10(4):163-1780	Description of telehealth modes of delivery and review of some articles relating to CE. Describes V/C vs pre-recorded (S/F) methods of delivery as well as introducing topic of health information available from Internet web sites.	Review citing 34 references	Data extracted and summarized	None - literature survey	In terms of CE few studies were available to the authors. Review includes TH applications in neurology, radiology, dermatology, mental health, oncology, using various technologies	Sample sizes relatively small	Concluded that TH can be cost-effective when transportation costs are borne by HCP. Otherwise benefit accrues to patients. From a societal perspective TH is economically viable when distances are substantial.

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Author / Article Title / Year / Country / Location	Purpose / Objectives	Design	Analysis	Participants: age / gender / groups	Intervention / Duration	Follow-up: sample size; dropout	Outcomes / Socio-Economic Indicators
Lobley D: The economics of telemedicine. J Telemed & Telecare 3: 117-125, 1997	Survey of costs associated with TM and potential revenue streams	Literature review 14 references	No analysis per se Cites 10 constraints for the growth of TM and 19 questions that need to be answered in conducting a cost analysis	Mentions various studies, but no numbers provided	None	No follow-up	Patient outcomes are ignored. Paper concentrates solely on cost of implementing TM. Concludes that reimbursement is likely to be greatest deterrent to future growth of TM
Capner M. Videoconferencing in the provision of psychological services at a distance. Journal of Telemedicine and Telecare, 2000, 6 Australia	To review literature on the use of video-conferencing to provide psychological assessment (both initial mental health interviews and psychometric testing), psychological interventions & supervision of psychologists practicing in isolation. Legal & ethical issues are also considered.	Review Study (numbers not stated)	Not described	Not reported	Duration not reported. Psychological services discussed include: Initial interview; Use of scales for rating symptoms; Ways to increase reliability of initial assessment data; Consumer experience; Comparison of administering psychomotor tests in-person v/c; Interventions provided for individuals, families & groups; Legal issues.	Not reported	Research results on using V/C for psychometric testing are inconsistent. Absence of outcome based research for therapy. Dearth of evidence regarding reliability of psychological services provided using V/C. Legal issues identified (applied to physicians only) include: Consent, Reimbursement, Licensing & Liability.

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Author / Article Title / Year / Country / Location	Purpose / Objectives	Design	Analysis	Participants: age / gender / groups	Intervention / Duration	Follow-up: sample size; dropout	Outcomes / Socio-Economic Indicators
Pullum J, Sanddal N, REMT-B M, Obbink K. Training for Rural Prehospital Providers: A Retrospective Analysis from Montana, 1999. Pre-hospital Emergency Care, 3(3):231-238.	Provides a retrospective analysis of training methods over the past 25 years to examine the origins of training specific to Montana to shed light on successful, nontraditional training delivery methods currently being used.	Review Published & unpublished articles; # not reported.	Discussed methods of projects reviewed; not methodology for analysis of this review. Stated they analyzed strengths & weaknesses of each of the 5 training programs.	Literature review but refers to rural Montana's pre-hospital emergency care providers who are traditionally volunteer personnel.	Included 5 training programs used in Montana: -Train-the-Trainer; -Local Cluster with videotape & guided practicals; -Circuit Rider training with interactive videodisc (IVD); -Interactive video teleconference & -TENKIDS state-wide electronic infrastructure i.e., IVD – can deliver high-quality consistent training across a broad geographic area.	6,500 pre-hospital providers; 85% are volunteers; majority affiliated with 1of 121 licensed transporting ambulances services; each handles 25-50 responses/yr; required to take 24 hrs of continuing education annually.	The most successful remote strategies appear to be those delivered to the individual in the community rather than requiring the student to travel or to deliver equipment & materials physically to the community. Providing a consistent computer platform across all EMS agencies has been success-ful. Formal, prospective comparisons between traditional & electronic delivery of CE are in progress
Boland GWL: Review - Teleradiology: Another revolution in radiology? Clin Radiol 53: 547-553, 1998	Review of teleradiology in the context of its potential impact on HCD	Literature review 32 references	Not a review of scientific studies per se, this is a primer on the status of teleradiology in 1998 and the inherent risks attached to it	No participants	None	No studies analyzed	No outcome measures Socio-economic factors addressed only in sense of radiologists' desire to protect their business.

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Author / Article Title / Year / Country / Location	Purpose / Objectives	Design	Analysis	Participants: age / gender / groups	Intervention / Duration	Follow-up: sample size; dropout	Outcomes / Socio-Economic Indicators
Kinsella A: Home telecare in the United States. J Telemed & Telecare 4:195-200, 1998	To identify emerging trends in home care with specific reference to telecare	Literature review 17 references	No analysis Two approaches to telecare described	Primarily patients suffering from chronic diseases that need some form of monitoring in the home	Two forms of telecare described: A) electronic care substitutes for in-person visits B) data collected by telecare but augmented with educational material	No follow-up	Main thrust is the decreasing support for homecare in the US. Telecare shown to result in savings but patient outcomes not addressed - presumed to be equivalent "Improved outcomes" are translated into "avoided hospitalizations"
Eedy D.J., Wootton R. Teledermatology: a review. In: Brit J Dermatology, 2001: 144: 696-707	Reviews modes of delivery of teledermatology - both V/C and S/F. Suggests pros and cons of each mode of delivery. Intended primarily as an introduction to teledermatology for dermatologists considering these modes of service delivery.	Review citing 76 references	Data extracted and summarized augmented by authors' own experience	None - literature survey	Studies cited included both V/C and S/F compared to FTF for dermatology consults	Samples sizes relatively small with few papers having been published.	Most studies deal with accuracy of diagnosis which appears to be good but not as good as FTF CE suggests S/F has advantage over V/C but that it lacks immediate patient and may lead to delays in reaching Dx. S/F avoids need to schedule presence of both parties simultaneously
Benger, J: A review of minor injuries telemedicine. J Telemed and Telecare. 5 (Suppl 3): S3: 5-13, 1999	To assess use of TM in A&E environment for minor injuries	Review study (5 studies, 1 RCT) 71 references	Data considered primarily from perspective of correctness of Dx and subsequent F/u	Qualified HCPs Patients with minor injuries reporting at remote clinics staffed by ENPs	Included use of V/C as well as S/F for radiographs and Tel consultations	5 studies in all. Relatively few patients seen by TM (<1%) Patients seen by TM: 51 120 45 150 104 (RCT)	Conclude that greatest advantage is use of TM to obtain opinion wrt radiograph Discussion concerning quality of teleradiology concludes that minor injuries does not require high technical standards set by ACR

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Author / Article Title / Year / Country / Location	Purpose / Objectives	Design	Analysis	Participants: age / gender / groups	Intervention / Duration	Follow-up: sample size; dropout	Outcomes / Socio-Economic Indicators
Garshnek V, Burkle FM: Applications of telemedicine and telecommunications to disaster medicine. J Amer Med Inf Assoc. 6:1 26-37, 1999	Review of instances where TM has been used in disaster and combat theatre situations	Literature review and author experience 11 examples cited: 4 civilian (1 staged), 7 military 64 references	Analysis purely based on anecdotal evidence	Of 11 examples cited only 3 are natural disasters, 7 related to military combat zones, 1 staged demonstration	TM, both V/C and S/F used to provide support for medical teams in disaster and combat environments	11 examples; patient numbers cited in only 4 instances; all relatively small numbers	Two examples demonstrate evidence of improved Dx, change of treatment or decision to evacuate in small numbers of patients No obvious evidence of outcome measures having been conducted.

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APPENDIX N: CRITIQUE REVIEWS

Methodological Problems	**Policy Recommendations**	**Applicability to Alberta**
Few studies and heterogeneity prevented pooled statistical analysis. No studies included formal economic analysis. Moderate	Be cautious about recommending increased use and investment in unevaluated technologies. Ensure clinical application for proposed application is established 1st. Telemedicine may result in fundamental changes in practice	Reinforces belief to base clinical applications on need & to continue investment for evaluation of technologies Be alert to need/ opportunities to change clinical & administrative practices

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APPENDIX N: CRITIQUE REVIEWS

Methodological Problems	Policy Recommendations	Applicability to Alberta
Methodologic quality of many studies reported to be low. Referred to two scales used to determine results but no report of scaling or of findings based on the scales found. Low	Further studies with good statistical power need to be done to demonstrate the efficacy of TM for diagnostic & management decisions Use new methodologies e.g., "Tracker Trials" to systematically assess the evolution of TM. Advocate journal editors use restraint in publishing low quality evaluation trials. Decisions to use TM be based on evidence showing comparable patient outcomes in hospital/office & improved outcomes in homecare	Reinforce the need to invest in high quality research studies to evaluate clinical outcomes. Use information to select TM applications.

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APPENDIX N: CRITIQUE REVIEWS

Methodological Problems	Policy Recommendations	Applicability to Alberta
Limited by quality of studies reviewed but all studies met study selection criteria.	Consider adjusting reimbursement categories to compensate physicians for telephone calls.	Reinforce the need to invest in high quality research studies to evaluate clinical outcomes.
High	State that RCT's provide best evidence for clinical practice recommendations & reimbursement policies.	Reimbursement for TM needs to be evaluated.
	Application of TM should not be limited to physician-to-physician communication.	Continue to promote all clinical disciplines assess need for & use of TM.
		Make certain to give due consideration to use of telephone applications in delivering distance clinical care.

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APPENDIX N: CRITIQUE REVIEWS

Methodological Problems	Policy Recommendations	Applicability to Alberta
Paucity of methodological sound studies found; partial approach impedes generalizability & neglects the comprehensive analysis of long- term implications of a system. Identified specific types of design to best meet specific questions e.g., analysis of opportunity costs to show value of health resources in terms of best alternative use for such resources. No methodological problems identified in this study itself.	The need for better designed & conducted trials (RCT's preferred). Clinicians, policy makers and HCP's should not assume that peer reviewed publication is necessarily an adequate guarantee of quality for economic evaluations of TM.	Critically appraise any findings. If uncertain of findings, access qualified researchers to interpret results.

Methodological Problems	Policy Recommendations	Applicability to Alberta
Methodological problems of studies reported. This study evidenced extensive rigor in selection & analysis. Conclusions tightly linked to objective. Extensive appendix of analyses of classification by individual study.	Challenges remain in providing credible assessments of TM applications and in finding the resources necessary to undertake them. As TM moves in to long-term use, consider effect on health status, costs & organization as well as ethical, social issues, & possible risks. Approaches for economic analysis need to include sustainability of the service; decisions on equipment & tele-communications; effect on the overall use of health program resources & measurement of outcome.	Use this review as a resource for specific policy decisions, for selecting research areas; what measures to use in addressing specific TM categories & for clinicians looking at new TM applications. Continue to support high quality research and to look for resources to fund it.

APPENDIX N: CRITIQUE REVIEWS

Methodological Problems	Policy Recommendations	Applicability to Alberta
Most studies referred to pilot projects & short- term outcomes. Most studies were low quality. Very thorough review of the literature using scientifically valid criteria. Extensive reference listing. High	Consider the effects of technology on the time-related consequences of health care services & on organizational issues to strengthen assessment of TM. Further assessment studies in TM are needed & need to address: Aspects of TM in routine use; Their longer term impact on health status; Costs; Organization; Sustainability; Equipment & telecommunica-tions; Impact on overall use of health program resources & Measurement of outcomes.	Heed the advice, that in the absence of sound evidence for TM programs, to continue to develop business cases for new programs (with data collection and analysis requirements). Consider giving priority to program areas where even limited evidence is showing improvements. This approach requires reasonable selectivity but allows for growth in the absence of strong evidence rather than putting TM 'on hold' until clear evidence is obtained.

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APPENDIX N: CRITIQUE REVIEWS

Methodological Problems	Policy Recommendations	Applicability to Alberta
Literature search limited to MEDLINE database. Selection of literature was the only research method described. Inclusion criteria not well described Focused on 'break-even analysis'. Conclusions appear more opinion-than evidence based. Extensive reference list. Very low	Important to distinguish between cost-effectiveness for whom –society/ third party payer/ health provider/patient? TM may shift rather than save costs e.g., homecare	Provides further information to consider in designing and interpreting future research in considering the cost-effectiveness of TM in decision-making.
Quality of findings affected by methodological deficiencies e.g., small sample sizes, context & study designs of published literature reviewed.	Issues identified needing to be addressed include: Suitability of TM applications; Effects on doctor-patient relationship; How communicative issues affect the delivery of health care; & Limitations of TM. Future research needs to be more scientifically robust to assist in making more informed decisions about the appropriate use of TM.	Consider what research on patient satisfaction & what tools will give the most reliable, valid & generalizable information.

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APPENDIX N: CRITIQUE REVIEWS

Methodological Problems	Policy Recommendations	Applicability to Alberta
Majority of studies descriptive; 20% used a control group for comparison & 9% used RCT. Most quantitative; 19% had a qualitative component; some did not describe the study design. Logical linkage to objective. Provided thorough analysis of each research component. Extensive reference listing Mod	Larger & more carefully designed studies must be based on adequate probability samples & provide sufficient methodological details to assess the reliability & generalizability of the results. Further investigation of factors that influence patient acceptance of TM is indicated.	Read & interpret findings critically & be careful about generalizing the findings to the AB context.

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APPENDIX N: CRITIQUE REVIEWS

Methodological Problems	Policy Recommendations	Applicability to Alberta
Literature search limited to MEDLINE and HealthSTAR databases. Very thorough review of literature using tested instruments for analysis. Comprehensive description of each article. Extensive reference list High	Further research to: more fully understand the nature and content of the communication process; the interpersonal dynamics associated with TM and its effects on health care outcomes, improve technology to better facilitate communication; formulate behavioral norms to aid TM transactions & provide insight on distribution of decision-making power between consultation participants; effect on patient trust & privacy & exposure of doctors to claims of malpractice.	Such evidence needs to be available to clinicians & patients to move clinical activity forward in AB

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APPENDIX N: CRITIQUE REVIEWS

Methodological Problems	Policy Recommendations	Applicability to Alberta
- studies found were not presented - valuable as a methodological study Recognized the instrument used to analyze data was not designed specifically for TM studies but cited the checklist to be secondary to the importance of assessing the quality of the evidence re: costs & benefits found in the studies. Rationale for each recommendation clearly described.	Recommended cost-effectiveness research should focus on "Should we do this?" Cited 10 recommend-ations to assist researchers improve methodology of future research on cost-effectiveness.	Specific recommend-ations should be beneficial in assisting researchers design future research studies on CBA that will better substantiate futuristic policy direction.

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APPENDIX N: CRITIQUE REVIEWS

Methodological Problems	Policy Recommendations	Applicability to Alberta
Search of Medline database only plus papers he had knowledge of. No methodological analysis process reported or identified. Does state the importance of sharing experience & to do so by: 1. writing & publishing experience; preferably in peer reviewed journal. 2. carrying out formal evaluations whenever practical.	Suggests having an international body or national TM society take an overall coordination role in running trials, performing evaluations & disseminating results. Need to conduct research that will answer the question "In terms of global health-care, is TM actually relevant?"	Should these recommended functions be the responsibility of the universities or should Alberta Wellnet examine their role in regard to providing such centralized coordination?
Small sample sizes; Search strategy broad – uncertain of all papers being included; All studies reviewed had methodological limitations. Conclusions drawn directly related to objective.	Were not able to make recommendations for provision of cancer services in rural & remote areas Recommended priorities for further research using RCT's: Shared Care; Rural Practitioners' willingness to provide care; & Benefits & disadvantages of Teleoncology	Need for clinical research to be evaluated through the use of RCT's.

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Methodological Problems	**Policy Recommendations**	**Applicability to Alberta**
Low Unable to assess quality of design & analysis. Well referenced but format makes it very difficult to read.	To enhance decision making, need to obtain good data on effects of TM on such areas as costs, access, practice patterns, patient management & policy development. Other research topics that would help inform Medicare policy makers include: -Payment; -Use; -Appropriateness -Outcome based quality assurance. Provide a list of research questions that need to be answered to assist with research in support of the areas above.	Need to recognize that this study is 7 years old but many of these questions still do apply e.g., that we are still looking for ways to obtain high quality data on the issues of cost, CE, effects on patient management & acceptability. If this information could be obtained, it would assist policy makers with the difficult decisions facing them in those areas.

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Methodological Problems	Policy Recommendations	Applicability to Alberta
Quality of findings affected by methodological deficiencies in peer reviewed published literature reviewed.	Use of controlled trials to demonstrate the benefit to the patient's health care, be achieved at the lowest cost & with the most familiar technology. Utility of ongoing consultations needs to be explored. Until completed, limit use to exploratory basis or under-served communities. Studies need to determine: When telepsych is effective; What age groups; Under what conditions; Cost effectiveness.	Take under consideration in future research but recognize that other studies, including those of the Alberta Mental Health Board, have evidenced utility in telepsychiatry Recognize need to more definitively determine CBA to patients, providers, government and society.

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APPENDIX N: CRITIQUE REVIEWS

Methodological Problems	Policy Recommendations	Applicability to Alberta
Sample sizes and treatment effects small No studies of CE	Most studies assessing efficacy or cost are insufficient to permit definitive statements supporting benefits of TM Future studies should focus on use of TM in conditions where burden of illness and/or barriers to access for care are significant Studies need to follow RCT model	Supports concept that TH improves access without compromising outcomes, but is unlikely to result in cost savings to HCPs
Few details on methods Variety of tests used. Small number of studies (15) Patient numbers quoted in only 3 instances and they were low.	POTS can be used for assessment of cognitive state providing limitations are recognized. V/C shows promise for future and allows wider range of assessment	Unlikely to impact AB TM program which already makes considerable use of V/C for mental health assessments and consults.

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APPENDIX N: CRITIQUE REVIEWS

Methodological Problems	Policy Recommendations	Applicability to Alberta
No specific methodological analysis process reported but synthesis of information identified. Conclusions relate directly to objective. Variety of research designs for specific problems recommended.	Need for high quality research of long term impact of TM on health status, costs, & organization. Need to conduct evaluation of hard data at the local level on routine use of TM to obtain realistic information on costs & societal benefits as well as opinions & perspectives of clients, HCPs', organizations & payers. Other dimensions requiring study include: Sustainability; Equipment & telecommunications changes; & Impact of increased use by nonspecialist staff. Compare TM initiatives with conventional alternatives.	Excellent paper to reference when planning new research, creating a business case for new programs &/or developing or enhancing evaluation of existing programs. Pay attention to need for local research for economic analyses and be careful about generalizing findings.

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APPENDIX N: CRITIQUE REVIEWS

Methodological Problems	Policy Recommendations	Applicability to Alberta
Described each of the four elements with study examples & then cited 'Key Points' from each to assist researcher with future studies. Conclusions matched objective. Extensive Reference List	Tests for ergonomics & usability of radiology systems need to be conducted. Further research on general tele-consultations is needed; RCT's preferred. Need to develop an understanding of acceptable minimums for each TM application before addressing particular requirements in specific settings to determine standard of equipment. Map out a research agenda for future studies of TM systems Consider the effects of TM on patient management & societal benefits to accurately assess the value of TM.	Recognize that suggestions to develop specifications have been worked on in AB; e.g., technical standards for interoperability have been developed & work is ongoing for more specific clinical applications with the lead being taken by ARC & Wellnet in collaboration with health authorities & universities e.g., HTU, UofC. Should a research agenda be mapped out? If so, by whom?: Collaboratively among the above groups?

Note: Abbreviations used in this document are described in Appendix D

Methodological Problems	Policy Recommendations	Applicability to Alberta
Described findings as per model with study & assessed effects of TM using 3 specified categories. Conclusions matched objective. Extensive Reference List	Further research to: - Demonstrate that TM is safe; - Establish how TM can best be performed; - Prove that it is acceptable; - Prove it is medically justified & - Prove TM is an appropriate use of public funds.	Further supports the need for further research into user & clinician acceptability; evidence of medical outcomes & more specific costs related to benefits to individuals/ society.
Few studies available for review. Major problem with economic analysis is the rapidly changing costs associated with advances in technology	Can be both clinically and cost effective when used in the right circumstances. Needs analysis required to identify proper technology	Reinforces necessity to conduct proper needs assessment and choose appropriate solution to problem to be resolved. Savings are greatest for the patients Need to identify circumstances that provide greatest opportunity of success.

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APPENDIX N: CRITIQUE REVIEWS

Methodological Problems	Policy Recommendations	Applicability to Alberta
Various studies alluded to only in passing. No firm data presented to support case.	Concludes there is a lack of information about costs and benefits of TM Lack of reimbursement likely to be greatest inhibitor Despite potential for improved patient care and reduced costs for patients, many HCPs concerned that TM will lead to increased costs through better provision to currently under-served areas.	Reimbursement exists in AB although it may still present some barriers. HCPs are concerned about increased costs due to improved access TM presents opportunity to "export" HC expertise and should be further investigated as a revenue source
No methodology described but specific papers, their content, issues and results are cited. Very low	Vast opportunity for further research on psychological services provided via v/c; by physicians and other related disciplines.	Limited Psychological services have been added to the AMHB V/C programs. Therefore, provincial activity will be available for evaluative research.

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APPENDIX N: CRITIQUE REVIEWS

Methodological Problems	Policy Recommendations	Applicability to Alberta
Unable to assess quality of design & analysis.	The aging of rural America & the shrinking volunteer pool warrants investment in technologies & infrastructure to support training needs of rural & remote pre-hospital care providers. Rigorous examination of each new technology & approach should be undertaken and reported in the appropriate literature [EMS literature cited] Administrators, educators & providers must all be challenged to look for creative solutions to meet current & future educational demands & needs.	Alberta is continually looking for new, effective & appropriate ways of providing CE to all HCPs. The question is how to determine the best ways & then to create policy and secure funding to support the process.
Review of technology. No formal studies included	Teleradiology has potential to revolutionize delivery of radiology services	From the AB perspective the issue of licensure is raised as a potential barrier to wider deployment of TM and suggestion is made that patients will demand service by centres of excellence outside of jurisdiction that may not otherwise be available to them AB has already witnessed reluctance of radiologists to embrace TM when it impacts their business model

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APPENDIX N: CRITIQUE REVIEWS

Methodological Problems	Policy Recommendations	Applicability to Alberta
Primary intent of paper to draw attention to the potential of telecare as an alternative to reduce costs No good statistical evidence provided	Few studies indicate cost-effectiveness of telecare. Of 1800 home care agencies in the US only 50 have engaged in telecare Changes in delivery of acute care and increasing population of chronically ill patients will lead to greater use of telecare	Telehomecare is regarded as the next major step for TM. With the advent of SuperNet and the long distances that home care providers need to travel in rural communities, telecare offers potential in AB
Few studies available for review.	Review suggests teledermatology offers promise but that further research into outcomes and limitations needs to be conducted	Little (if any) dermatology is presently conducted in AB. This paper offers some assistance in terms of equipment selection but technology is changing rapidly so that such advice might be outdated.
Small number of studies, small number of patients, only one RCT No formal CE study	Predicts that minor injuries TM will become so widespread and so well accepted throughout UK that its use will be considered to be the best available practice. Failure to use TM would be considered inappropriate, or even negligent.	AB could benefit from more comprehensive introduction of TM in the ER environment to assist staffing levels at remote locations. Proper equipment including teleradiography systems would be required.

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Methodological Problems	Policy Recommendations	Applicability to Alberta
Few studies Only 3 are actual disaster scenarios, none of these have patient data included. Concentrates on military applications of TM in combat zones.	Equipment needs to be rugged. Communication needs to be via satellite Suggests use of Internet but ignores disruption of Internet services in disaster situations. Concentrates on military deployment.	No specific applicability in AB where natural disasters are likely to be few in number and small in effect.

APPENDIX O: ECONOMIC ANALYSIS

	Mainly economic analysis	Includes economic analysis	Specialty	Economic Perspective	HRQOL measure	Cost analysis	CBA	RTC	CEA
Agha et al. 2000	1	1	Rural	Society	0	1	0	0	0
Bailes et al. 1997	1	1	Radiology	health care, transportation	0	1		0	0
Bergmo 1997 (ENT)	1	1	Rural	Society	0	1		0	0
Bergmo 1996 (X-ray)	1	1	radiology	health care	0	1	0	0	0
Bergmo 2000 (A CMA of realtime teledermatology)	1	1	Rural	Health care	0	1	0	0	0
Bracale et al. 2002	0	1	Radiology	Health care	0	1	0	0	0
Brumage et al 2001	1	1	radiology	health care, transportation	0	1	0	0	0
Dansky et al. 2001	1	1	Homecare	health care	0	1	0	1	0
Davis 1997	1	1	Radiology	helath care (private provider)	0	1	0	0	0
Dawson et al. 1999	0	1	Homecare	society	1	1	0	1	0
Doolittle et al 1997	1	1	Rural	Health care	0	1	0	0	0
Doolittle 2000	1	1	Homecare	Healthcare	0	1	0	0	0
Doze & Simpson 1998	1	1	Mental health	Healthcare	0	1	0	0	0
Doze et al. 1999	1	1	Mental health	Healthcare	0	1	0	0	0
Elford et al. 2001	0	1	Mental health	health care, patient	0	1	0	0	0
Finley et al. 1997	0	1	Pediatrics	Health care	0	1	0	0	0
Friedman et al. 1996	0	1	Homemonitoring	health care	1	0	0	1	1
Halvorsen SK 1996,1997	1	1	Radiology	society	0	1	0	0	0
Johnston et al. 2000	0	1	Homecare	health care	1	1	0	1	0
Maas et al. 2000	1	1	Radiology	Health care	0	1	0	0	0
Malone et al. 1998	1	1	Ultrasound	Health care	0	1	0	0	0
Massman et al.1999	1	1	Rural/remote	Patients	0	1	0	0	0
Mielonen et al. 2000	0	1	Mental health	Society	0	1	0	0	0
Rendina et al. 1998	0	1	Pediatrics	Regional provider cost	0	1	0	0	0
Rendina et al. 2001	0	1	Pediatrics	Regional provider cost	0	1	0	0	0
Riegel et al.2000	0	1	Geriatrics	health care	1	1	0	1	0
Schopp et al. 2000	0	1	Mental	Societal	0	1	0	1	0
Subirana Serrate et al. 2001	1	1	Homecare	health care, insurance co.	0	1	0	0	0
Simon et al. 2000	0	1	Mental health	health care, patient's time	0	1	0	1	0
Simpson et al. 2001 a, b	1	1	Mental health	health care, patient's time	1	1	0	0	0
Specht et al. 2001	1	1	Geriatrics	health care	0	1	0	0	0
Stoeger et al. 1997	1	1	radiology	health care, travel	0	1	0	0	0
Tang et al. 2002	0	1	Mental	health care	0	1	0	0	0
Trott & Blignault 1998	1	1	Mental	health care, patient	0	1	0	0	0
Walz et al.1999	1	1	radiology	health care, travel	0	0	1	0	0
Total number of studies	**22**	**35**			**5**	**33**	**1**	**7**	**1**

APPENDIX O: ECONOMIC ANALYSIS

				1	2	3	4	5
Transportation costs	Break-even analysis	Indirect costs	**Economic Analysis Criteria: (Drummond et al, 1995)**	**Well-defined question**	**Alternatives relevant comprehensive**	**Effectiveness**	**Identification of all Costs and Effects**	**C & E measured accuratel**
1	0	1	Agha et al. 2000	1	1	0	0	0
1	0	0	Bailes et al. 1997	0	1	0	0	0
1	1	1	Bergmo 1997 (ENT)	1	1	0	0	1
1	1	0	Bergmo 1996 (X-ray)	1	1	0	1	1
1	1	1	Bergmo 2000 (A CMA of realtime teledermatology)	1	1	0	1	1
0	0	0	Bracale et al. 2002	1	0	0	0	0
1	0	0	Brumage et al 2001	1	1	0	1	1
0	0	0	Dansky et al. 2001	1	1	1	1	1
1	0	0	Davis 1997	1	1	0	1	1
1	0	1	Dawson et al. 1999	1	1	1	1	1
1	0	0	Doolittle et al 1997	1	1	0	0	0
1	0	0	Doolittle 2000	1	1	0	0	0
1	1	0	Doze & Simpson 1998	1	1	0	0	1
1	1	0	Doze et al. 1999	1	1	0	0	1
1	0	0	Elford et al. 2001	1	1	0	0	0
1	0	0	Finley et al. 1997	1	1	0	0	0
0	0	0	Friedman et al. 1996	1	1	1	0	0
1	1	1	Halvorsen SK 1996,1997	1	1	0	1	1
0	0	0	Johnston et al. 2000	1	1	1	1	0
1	0	0	Maas et al. 2000	1	1	0	0	0
1	1	1	Malone et al. 1998	1	1	0	0	1
1	0	0	Massman et al.1999	0	1	0	0	0
1	1	1	Mielonen et al. 2000	1	1	0	0	0
1	0	0	Rendina et al. 1998	1	1	0	0	0
1	0	0	Rendina et al. 2001	0	0	0	0	0
0	0	0	Riegel et al.2000	1	1	1	0	1
1	0	1	Schopp et al. 2000	1	1	0	0	0
1	0	0	Subirana Serrate et al. 2001	1	1	0	0	1
0	0	1	Simon et al. 2000	1	1	1	1	1
1	1	0	Simpson et al. 2001 a, b	1	1	0	1	1
1	0	0	Specht et al. 2001	1	1	0	1	1
1	0	0	Stoeger et al. 1997	1	1	0	0	1
1	0	0	Tang et al. 2002	1	1	0	0	1
1	0	0	Trott & Blignault 1998	1	1	0	0	0
1	1	0	Walz et al.1999	1	1	0	1	1
29	**10**	**9**	**Total number of studies**	**32**	**33**	**6**	**12**	**19**

APPENDIX O: ECONOMIC ANALYSIS

6	7	8	9	10	
C & E valued credibly	Timing Discounting C & B	Incremental analysis	Uncertainty/ Sensitivity analysis	Exclusive discussion	Sum of the criteria
0	1	0	1	0	4
0	0	0	0	0	1
1	1	0	1	1	7
1	1	0	1	1	8
1	1	0	1	1	8
0	1	0	0	0	2
1	1	0	1	1	8
1	1	0	0	1	8
0	0	0	0	0	4
1	0	0	0	1	7
1	0	0	0	1	4
0	0	0	0	0	2
0	0	0	0	0	3
0	0	0	1	0	4
1	0	0	0	1	4
0	0	0	0	1	3
0	0	0	0	0	3
1	1	0	1	1	8
0	0	0	0	0	4
0	0	0	0	0	2
1	0	0	0	1	5
0	0	0	0	0	1
1	1	0	1	1	6
0	0	0	0	1	3
0	0	0	0	0	0
0	0	0	0	0	4
0	0	0	0	1	3
0	0	0	0	1	4
1	0	0	0	0	6
1	0	0	1	1	7
1	0	0	0	0	5
1	0	0	0	0	4
1	0	0	0	1	5
0	0	0	0	0	2
0	0	0	1	1	6
16	**9**	**0**	**10**	**18**	**4.43**

APPENDIX P: CRITIQUE POLICY

Author / Article Title / Journal / Year / Country	Study Design	Modality	Participants:	Intervention / Exposure	Outcomes / Socio-Economic Indicators	Strength of Study
Patient Satisfaction						
Gustke S, Balch D, West V, Rogers L. Patient Satisfaction with Telemedicine. Telemedicine Journal 2000, 6(1):5-13. **USA**	Descriptive Study	Patient Satisfaction (PS)	66.98% of the 739 real-time interactive TM clinical consultations at the TM Center at East Carolina University School of Medicine in Greenville, NC situated in the middle of a large rural area (hub to 8 spokes serving 29 counties) including: --6 hospitals; -1 rural health clinic; -1 maximum security prison.	495 real-time Interactive video TM consultations in a variety of clinical areas i.e.: -Dermatology-33.5% -Allergy-21% -Cardiology-17.8% -Psychiatry-5.1% -Endocrine-4.2% -Rehab-4% Few in: Neprhology, Rheumatology, Pulmonology, Neurology, ENT, OBS, Infectious Diseases, Hematology /Oncology, Plastics. Considered age, gender, race, education, income & insurance. Summarized 12 PS Studies in traditional non-TM care as well.	Findings are consistent with other studies reporting high levels of satisfaction. Overall satisfaction very high @ 98.3% compared to average PS of 92.8% in other studies reviewed. Suggest PS with TM may be related to reasons for dissatisfaction in non-TM settings i.e.: -Ease in arranging appointments; -Wait times; -Travel time & -How time with physician is spent. 98.7% indicated TM made it easier for them to obtain medical care. No correlation found between gender & self-consciousness. More than 80% of patients <45 years preferred TM to traveling 2 hrs for a consult compared to <70% of patients >70 years old;	Low No analysis described, attempted comparative information (from traditional non-TM Care and other studies in TM). Correlation analysis completed on data found in this study. Survey questions limited in content & scope of service; all quantitative; no evidence of qualitative data. Long list of references

Note: Abbreviations used in this document are described in Appendix D

Author / Article Title / Journal / Year / Country	Study Design	Modality	Participants:	Intervention / Exposure	Outcomes / Socio-Economic Indicators	Strength of Study
Mair F, Whitten P, May C, Doolittle G. Patients' perceptions of a telemedicine specialty clinic. 2000 Journal of Telemedicine and Telecare. 6(1):36-40 **USA** (Authors from UK & USA)	Qualitative Study	Patient satisfaction	22 adults who were over 18 y.o.; did not have a history of mental impairment and/or hearing or other impairment that would interfere with telephone conversation. Age range: 37-89 yrs. F=14; M=8 Oncologist Specially trained nurse at the rural site	2-way interactive video from the tele-oncology clinic University of Kansas Medical Centre to rural site (approx 450 km apart). Specially trained nurse at the rural site acted as a proxy to assist with palpation for the clinical exam.	All patients expressed satisfaction with TM with the principle advantage being convenience of access & increased contact with their physician. 50% of patients qualified their satisfaction with 2 factors: 1.To have FTF visits on occasion e.g., for the first visit & to hear difficult news; 2.Concerned about providing more private information with nurse present + some uncertainty with who might be present but not on camera. Discrepancy between oncologist & patient perspectives as oncologist reported having diagnosed & giving sensitive news. 41% expressed concern about the reliability of the nurse as a proxy examiner. Differences accepted as "price to pay"	High Design & method of analysis clearly presented & followed.

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Author / Article Title / Journal / Year / Country	Study Design	Modality	Participants:	Intervention / Exposure	Outcomes / Socio-Economic Indicators	Strength of Study
Rural/Remote						
Smith A, Isles A, McCrossin R, Van der Westhuyzen J, Williams M, Woollett H, Wootton R. The point-of-referral barrier – a factor in the success of Telehealth, 2001. Journal of Telemedicine and Telecare, 7(Suppl 2), S2-75-78 **Australia**	Feasibility Study (Comparative)	Provider role; approach to referrals	Children & families in remote communities in Queensland, AU.	Full time Telehealth Coordinator Role as single point of contact vs conventional referral process i.e., shifted responsibility for telepediatrics from referrer to provider.	By providing a direct & convenient tele-referral service for the referring practitioner, telepediatrics became an increasingly popular technique. Transfer of responsibility for referral from a referring practitioner to a central Telehealth coordinator made clinical consultations at a distance become an easier option. Clinicians at the specialist site plus staff in regional hospitals are very supportive of the service; plan to further develop the service to include more hospitals. Prevented 12 transfers from Nov 2000 – April 2001 @ a cost savings of A$18,000. Other benefits: Improved planning &coordination of outpatient & inpatient services.	Moderate Minimal information on data collection & analysis.

Note: Abbreviations used in this document are described in Appendix D

APPENDIX P: CRITIQUE POLICY

Author / Article Title / Journal / Year / Country	Study Design	Modality	Participants:	Intervention / Exposure	Outcomes / Socio-Economic Indicators	Strength of Study
Nesbitt T, Hilty D, Kuenneth C, Siefkin A. Development of a telemedicine program. September 2000, West J Med, 173: 169-174. **USA**	Retrospective Review	(1000 consecutive TM consultations in the University of California (UC) Davis Health System (Medical Center with 6 urban/suburban primary care clinics, 2 rural clinics & 51 in prisons)	657 consecutive patients who consented to a TM consultation. PCP's (>204) Physician Specialists	Specialist care through a TM consultation.	Rural demand for TM higher than urban. High satisfaction among patients & PCP's; participation was voluntary; therefore may not be representative of all patients & PCP's. May result in increased interventions for patients in underserved rural communities who without TM had limited access to specialist services i.e., Medi-Cal recipients. Concern TM may erode involvement of PCP in their patients care; educational benefit from collaborating with Specialist. Reimbursement a barrier despite national policy (Jan 99) mandating Medicare reimburse-ment for TM in underserved rural areas; had little effect to date. Led to 2 RCT's on the delivery of home care health & psychiatry.	Low (but noted limitations) Minimal information on data collection & analysis. Made unsubstantiated assumptions e.g., Refusal rates not tracked but stated a 'high %' willing to use TM; only PCP's (204) from 2 rural clinics completed SS. Satisfaction data collected on 362/1000 patients. Data not generalizable to other settings Dx data were not collected; no clinical outcome measures; only subjective ratings of satisfaction; no control groups & study non-randomized

APPENDIX P: CRITIQUE POLICY

Author / Article Title / Journal / Year / Country	Study Design	Modality	Participants:	Intervention / Exposure	Outcomes / Socio-Economic Indicators	Strength of Study
Ricketts T. The Changing Nature of Rural Health Care. 2000, Annu. Rev. Public Health, 21:639(57), 639-657.	Opinion article (? Descriptive Study but I don't think so)	Role of Public health in rural communities.	Relates to residents and PCP's in rural communities.	Transformation in health care financing; introduction of new technologies; clustering of health services into systems & networks; but continued shortages of resources for rural health systems. Policies instituted to address some disparities by encouraging network development & TM & by changing rules for Medicare payment to providers. In hospitals found market-driven changes more dominant than policy directed reform.	Rural health policy & service research have matured into a recognizable segment of overall health policy domain evidenced by recent expansion of literature. Rural health care contexts are often forerunners of the more general health care system. Pressures for efficiency & cost control may create systems expected to function with far fewer resources; with heavy dependence on communications & telemetry, in which a heightened concern for outcomes places the systems in a unique ethical bind. Number & quality of public health services &/or a shift in services are resulting from policy shifts for funding & management practices. Policy & legislation are closely linked but market forces also exerts significant influence on changes to systems.	Data extracted from literature; synthesized & logically presented under headings of: Special Problems in rural health; Rural Health Professionals; Hospitals; Telemedicine; Networks & Systems; Policy & Legislation; Rural Public Health; & Quality of Care in Rural Places. Well referenced. Unable to assess quality of design & analysis.

Note: Abbreviations used in this document are described in Appendix D

Author / Article Title / Journal / Year / Country	Study Design	Modality	Participants:	Intervention / Exposure	Outcomes / Socio-Economic Indicators	Strength of Study
Preston J, Brown F & Hartley B. Using Telemedicine to Improve Health Care in Distant Areas. Hospital and Community Psychiatry, January 1992, 43(1): 25-32.	Academic Overview	Provider role	Provide overview of 'Pioneering Systems' in the US from 1959 (University of Nebraska) to present noting	TM as a health care delivery system to address problems in areas of distance or maldistribution that impacts or precludes high quality medical service. Process: -Overview of TM technology; emphasizing 2-way video & audio; -Describe pioneering programs; -Describe 2 major TM demonstration systems in Texas; -Discuss broader issues for research.	TM: -Cuts the costs of health care & improves its quality; -Puts the specialist where needed at the time needed; -Brings the medical educator & Primary HCP together at the 'electronic examining table'; -Enlivens CME with bedside teaching; & -Offers the US another tool for crafting a vigorous & prudent HC delivery system. Suggests the need to consider ethical & legal issues but notes that digitized messages are far more difficult to break into than telephone lines. Aim to develop an economic template for evaluating the cost feasibility of future TM services to rural areas.	

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APPENDIX P: CRITIQUE POLICY

Author / Article Title / Journal / Year / Country	Study Design	Modality	Participants:	Intervention / Exposure	Outcomes / Socio-Economic Indicators	Strength of Study
Taylor D. Do Targeted Efforts for the Rural Underserved Help Kill Comprehensive Reform? Winter 1999. The Journal of Rural Health, 15(1): 55-59. **USA**	Commentary	Brief historical overview of 20th century efforts to respond to under-served rural areas.	American public noting focus on care for the poor.	Framework for study grounded in 'Typology of Policy Networks' p.58, i.e., Sub government (Iron Triangle) i.e., 3 close-knit, powerful members (Executive Branch, Congress, Interest Group allied together) -Develop, implement & administer policy in narrow realm with little opposition or intrusion of outsiders -Relatively impervious to partisan changes in Congress or Exec. Br. Elastic Net: -Actors who work together for common goals; alone none is very powerful -Sensitive to partisan changes in Congress & Exec Br -Able to enjoy a modicum of policy success, but power ebbs & flows. Issue Network: -Loose-knit group of individuals and institutions; -Provide technical assistance in general policy area -Members likely to have same goals or objectives for meeting individual goals	Provided an overview of health policy in the US over past 60 yrs commenting on how the varying policy networks are used strategically to create policy &/or how they have often targeted more focused projects rather than deal with comprehensive reform nationally e.g., the poor are often targets of health care reform strategies; often, he argues, to change the focus and prevent (or "inoculate" against comprehensive large scale reform from occurring. Cite that the rise of formalized, targeted programs that address problems in specific rural areas has reinforced the view that problems in rural underserved areas are 'exceptions' and not symptom of broader health system problems and are thus appropriately dealt with by special solutions an not large scale changes.	Moderate Commentary therefore unable to assess quality of design & analysis. Well referenced.

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Author / Article Title / Journal / Year / Country	Study Design	Modality	Participants:	Intervention / Exposure	Outcomes / Socio-Economic Indicators	Strength of Study
Goldsmith L & Ricketts T. Proposed Changes to Designations of Medically Underserved Populations and Health Professional Shortage Areas: Effects on Rural Areas. Winter 1999. The Journal of Rural Health, 15(1): 44-54 **USA**	Modeling Study **(I suspect this one should not be included; again, it has no reference to TM/TH but it does indicate how policy can create different outcomes than intended so I have included it for now)**	'Rule' created to combine medically underserved population (MUP) and health professional shortage area (HPSA) designations published by the Bureau of Primary Health Care (BPHC) in the Federal Register, Sept 1, 1998.	American public; reference to rural & urban communities; focus on underserved communities. Included 3,081 counties.	Developed a model of the 'rule' to simulate results and conduct an impact analysis in an attempt to estimate the effects of the proposed regulations on non-metropolitan and rural communities by using national data sets & applying weightings & calculations described in the proposed rule to those data; then contrasted to the BPHC's impact analysis.	Projected results did not agree with the BPHC impact analysis. Found that overall rural counties had more to lose with a change in designation status than urban counties. Publication of proposed rule generated a lot of discussion about underserved designations & how they should be defined.	Moderate Analysis clearly outlined and followed. Data differed by 1 state from BPHC as data not available. Included several variables -Population count; -PCP count; -%of population, incomes <200% of poverty level; -% of racial minorities -Infant mortality rate & low birth weight; -% population linguistically isolated; -Population density; -Other variables.

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Author / Article Title / Journal / Year / Country	**Study Design**	**Modality**	**Participants:**	**Intervention / Exposure**	**Outcomes / Socio-Economic Indicators**	**Strength of Study**
Swanson, B. Information Technology and under-served communities. 1999. Journal of Telemedicine and Telecare, 5(Suppl 2): S2:3-10. **Australia**	**Overview/Think piece** ***(Excellent article that I suggest we use as reference in writing the report; recognize that it is more IT than TC but does address TC and provides more information on social indicators than most other articles to date).***	Overview from the South Australian Department of Human Services in Adelaide on the effects of IT in under-served communities.	Refers to 'under-served' communities e.g., -Rural & remote communities; -The aged; -Non-English speaking people; -Mentally ill; -Indigenous; -Illiterate.	IT TC TM (videoconferencing, S/F, data transfer of digitized images)	IT & TC are develop-ing rapidly but Health is regarded as being 10 years behind financial services, entertainment & direct marketing in the use of IT/TC in AU. Rural groups are not well positioned to take advantage of the changes due to poor infrastructure & lack of skills but they find growth of TM to be an indication of progress e.g., success with Telepsychiatry & Flinders University medical training program decentralized to rural environments. Medical workforce implications include: -Overall numbers; -Mix of HCPs; -Geographical distribution of HCPs; -Changing profession-al boundaries; -Changing skill requirements of HCPs	Highly useful information but unable to assess quality of design or analysis.

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					Likely social effects are "location independence" of a range of activities & widening gaps between the "information rich" & "information poor". Suggest that most of the under-served groups will fit into the 'information poor' category but that a key question is what new under-served groups will arise.	

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Author / Article Title / Journal / Year / Country	Study Design	Modality	Participants:	Intervention / Exposure	Outcomes / Socio-Economic Indicators	Strength of Study
Capalbo S & Heggem C. Evaluating TM Technologies in Rural Settings, April 1999. Policy Issues Paper No.10 USA	Academic Overview	Evaluation of TM technologies in rural communities. Cites that governments have invested millions of dollars in use of TC i.e.: -Equipment; -Infrastructure; -Incentives for consumers & HCPs Questions what measures are available to assist in determining where/ how to spend additional dollars & how to set policy accordingly.	None but refers to rural HCPs & consumers, and to rural communities.	Overview of TM technologies, USA government involve-ment in support of TM, and issues needing to be addressed in designing an economic framework to evaluate the net benefits of TM to rural communities & consumers.	There are potential benefits of TM but they have not been verified by research in the field setting. Opportunities for rural hospitals include: -Expanding its scope; -Improving quality; -Increasing CE in providing existing services; -Opportunity for urban hospital is widening the referral base. Only 1 program of many started in North America prior to 1986 was in operation by 1995 i.e., Memorial University, Nfld. Review of existing information found data collected usually is quantitative e.g.: # & types of consults classified by site, length of time involved, # of HCPs involved & limited information on characteristics of the patient e.g., income, occupation & zip code to look at context of the local situation.	Moderate Useful information but unable to assess quality of design or analysis.

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					Policy changes such as those resulting in widespread rural hospital closure led to innovation in rural health care delivery e.g., TM. ATSP survey (1997) identified 97 active TM programs in the US in 40 different categories; the most prevalent being radiology & clinic drug trials; then mental health, dermat-ology, cardiology, orthopedics & emerg-ency room triage.	

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Weisgrau S. Issues in rural health: access, hospitals, and reform. (Access to Health Care Services in Rural areas: Delivery & Financing Issues). Fall 1995. Health Care Financing Review, 17(1):1-10 US	Comparative Study	Role of hospital in rural communities i.e., impact of rural hospital closures on the populations previously served by the facilities; focusing on utilization & expenditures for health care services in areas that relied on a hospital prior to its closure.	Data from 6 States that had rural hospital closures in 1986 & 1987. Based on the Medicare population who are typically well insured & have considerable access to health care services. Admit that this may be the 'best case scenario'; that the impact of hospital closures on the more vulnerable populations e.g., Medicaid & uninsured may be much greater.	Data used to: -Determine the site of care for Medicare beneficiaries before & after closures, -Evaluate the effects of closures on inpatient utilization rates & -Examine the relationship between the utilization of physician services and changes in the availability of hospital services. Comparison made between areas that had a hospital closure; areas that did not have a closure & areas that had no hospitals during the study period. Expands on previous research & uses hospital & physician data to examine changes in health service delivery after closure of a rural hospital.	Discuss a variety of ways communities, providers, government & others have worked together attempting to create viable long term solutions e.g., HCFA programs to assist in stabilizing viability of rural hospitals (supports to develop limited service hospitals, Rural Health Care Transition Grant Program & provider networks) but that provision of adequate access to health care services in rural areas (especially to the smallest & most remote) continues to be a critical public policy concern. In several compar-isons, researchers found the opposite from what they had predicted to occur e.g., shift in patterns of inpatient utilization by residents in the closure area i.e., 28% increase in admissions to urban hospitals plus increase to teaching hospitals & rural referral centers that far exceeded the experience of the comparison hospitals.	Low to Moderate State a clear method of analysis but appear to concentrate more on the research of others than to show comparative findings from data cited. Conclusions largely cite the work of others and recommendation generalizes findings to Medicaid patients as well as those in the Medicare program even though the data was stated to be collected was that of the Medicare population.

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					State although TM has stimulated interest among legislators, policymakers, HCPs & others, that wide-spread use of existing systems is limited by factors such as: -Inadequate or underdeveloped technological & org-anizational infra-structure; -Absence of 3rd party payment policy for TM services & that low volumes have prevented researchers from conducting large-scale, evaluations of the effectiveness of TM services or acceptance by patients or providers.	

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Menolascino F & Potter J. Delivery of services in Rural Settings to the Elderly Mentally Retarded-Mentally Ill. 1989, Int'l J. Aging & Human Development, 28(4): 261-275. **USA**	Academic Overview	Provider role	Refers to Elderly Mentally Retarded-Mentally Ill population; specifically to those in rural areas.	Provides an overview of several rural service delivery models e.g. how to take the patient/carer to the service or bring the service to the patient/carer, & applies these models to the care needs of elderly mentally retarded-ill people & discusses their strengths & limitations. One model addressed is the Telecommunica-tions Model.	Their observations indicates that any service technology that lacks a guiding philosophy becomes empty, problematic & destined for either failure or non-utilization whereas technology guided by a powerful philosophy can have tremendous impact, e.g., philosophy of 'normalization' & decentralization for this population has had tremendous influence on the mobilization of families, aides, social workers, & citizens in providing community services. State that In addition, educators too often emphasize technology for its own sake rather than highlighting the values involved in the application of it. Drawbacks to using TM include: -Cost of equipment & ongoing maintenance; -Need for trained personnel to operate & maintain equipment	Low to Moderate Provides significant 'food for thought' but unable to assess quality of design or analysis.

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Telerehabilitation						
Vesmarovich S, Walker T, Pickett Hauber R, Temkin A, Burns R. Use of Telerehabilitation to Manage Pressure Ulcers in Persons with Spinal Cord Injuries. 1999, Adv Wound Care, 12: 264-9. USA	Exploratory Study	Rehabilitation provider role; changed patient role.	8 male patients (2 African American & 6 Caucasian) with Spinal Cord Injuries (SCI) who have pressure ulcers (PU); ranged in age from 38-78. Selected from population of patients referred to an outpatient wound care clinic; voluntary participation.	Used a Still Image Videophone to simultaneously transmit video & audio over ordinary telephone lines to assess PU's; average = 7 visits. Clinicians had to work together to resolve technical difficulties & standardize approach to examination; included teaching patient/family to use their senses of smell & touch to report changes.	Telerehabilitation is feasible to treat PU's in patients with SCI's Advantages over clinic visits e.g., greater patient/family control & involvement & clinicians able to see home environment that may be important to decision-making. High participant/ family/clinician satisfaction. Suggests promise for use in promoting consumer driven, team oriented, community-based approaches to long term services & supports needed by people with disabilities.	Described rationale, setting, sample, sample selection process, objective, data collection & findings. Conclusions directly related to objective.

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Glueckauf R, Whitton J, Nickelson D. Telehealth: The New Frontier in Rehabilitation and Health Care. **[Reference not on article]** 197-213.	Opinion chapter with a systematic review component	Focus on rehabilitation for people with physical or psychological disabilities in rural areas. Three areas of focus: 1.Resources 2.Access & 3.Costs	People at risk or currently diagnosed with chronic, disabling medical & psychological conditions.	Telecommunications mediated health services (TMHS). Divided into 4 telecommunications categories: 1.Internet Studies 2.Telephone 3.v/c Investigations 4.Face-to-face modalities (comparative studies).	TH promising to resolve access barriers for people with physical &/or psychological disabilities in rural areas Lack evidence about how & under what conditions TMHS leads to positive psychological & health care outcomes. Clinical Practice Guidelines may be critical to the broad-based acceptance of TH.	More opinion based using references as part of the review component under the 4 telecommunications category sections. Provides overview by extracting information vs. using specific data analyses methods.

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Telehomecare						
Hsiung R. Suggested Principles of Professional Ethics for the Online Provision of Mental Health Services. MEDINFO 2001: 1296-1300. **USA**	Presentation at MEDINFO 2001 possibly a demonstration study design.	Principles of professional ethics specific to online mental health service. Note: they are ethical; not clinical or legal.	Joint committee of the International Society for Mental Health Online (ISMHO) & the Psychiatric Society for Informatics (PSI) who discussed and developed these principles using the Internet to communicate.	A set of principles was produced & endorsed by ISMHO on Jan 9, 2000 with the goal to educate; not to regulate. Principles are intended to guide mental health clinicians who provide the services and patients who receive them.	Principles are:1.Informed consent (about the process, clinician, potential risks & benefits, safeguards & alternatives)2.Standard Operating Procedure (competence, legal requirements, structure of services, evaluation, multiple tx providers, confidentiality, records & existing guidelines. & 3.Emergencies (procedures & local backup) Concluded that traditional principles of professional ethics can be extended to online services; that comprehensive ethical principles can be developed by groups that cross disciplinary & national boundaries; & productive collaboration can take place entirely online & suggests that online clinicians have potential to regulate themselves.	Low to Moderate. Unable to assess quality of design or analysis. Extensive reference listing.

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Bauer K. The Ethical and Social Dimensions of Home-Based Telemedicine 2000, Biomedical Engineering, 28(3&4):541-544. **USA**	Think Piece	Provider:patient relationship	None but referred to HCPs and patients receiving tele-home care.	Examining the normative connections between home-based TM and: -Health care justice e.g., equitable access; -Quality of life for patients & family caregivers e.g., manner that patients receive services, autonomy & dignity; -Provider:patient relationships e.g., veracity, privacy confidentiality & fidelity. Considering the 2-way interactive video conferencing and telemetry equipment used by HCPs to interact with patients remotely by means of systems that merge computer, telephone & video.	Comments on the desire for medicine to be CE & efficient but to also want medicine & health policy to meet, at least, minimum ethical standards & moral ideals. Concluded that home based TM has ethical implications for medicine that can be overshadowed or confused with technologic concerns.	Low Unable to assess quality of design or analysis. Strong ethics references.

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Tang P, Curry R, Gann D. Telecare: New ideas for care and support @ home. Engineering and Physical Sciences Research Council (EPSRC), Science and Technology Policy Research. May 2000, The Policy Press. **UK**	Demonstration Project Definition of telecare is "the remote provision of care and medical services to people in their homes using digital information & communication systems", p.vi.	Aim is to explore the technical, social & economic opportunities and constraints to delivering new health, care & support services to residents in their own homes through the use of ICT's.	Focused on the UK but describes telecare in Europe, US & Japan *(selected due to availability of public data but noted that actual implementation of telecare in the home is in its infancy).*	Primarily desk-based & drew from a variety of reports. Anchor Trust (a not-for-profit organization involved in providing housing and care for older people) was the main collaborator. Held 2 workshops (1 in Kidlington & 1 in a sheltered home in Brighton) involving: -Members of policy-making community; -Voluntary organizations; -Residents from the sheltered home; -Academics; -Telecare developers; -Supply industry. Focuses on telecare activities in the health, housing & social sectors.	Overarching requirement for successful deploy-ment of telecare lies in its acceptance and involvement by users. User, patient & community focused telecare requires team approaches to delivering care & high degree of coordination linking health, housing, social and support services & other parties traditionally involved in providing separate care & support functions. This coordination could help identify appropriate funding streams. Technology can help to provide enhanced care delivery & quality by integrating various streams of service into a more coherent whole. Electronically integrated delivery systems across organizations & agencies (nationally & locally) will need to integrate records into a	Moderate but provides a comprehensive overview of approaches with related rationale. Literature review Listed & described examples of the main telecare projects under operational in the UK under headings of: -Project Name; -Institution/ organization; -Location; -Start date; -End date; -Project type/ description; -Partners; -Funding sources. Conclusions link tightly to descriptions in report.

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					computer-based care record repository to have historical & current information on users & carers readily available (could facilitate 'seamless' provision across the continuum of care). Telecare can be an effective way to support people to live in their own homes more independently but can also instigate a sense of isolation among care users as it implies a decreasing degree of physical contact. Outline stakeholder/ participants' benefits & risks for: -Patient/carer; Providers; Purchasers; Third Party payers; Infrastructure/ equip-ment providers/ housing providers. Describe need for different generations of care systems from now until 2020 i.e., 1.Standard Model; 2.Compact Model; 3.Deluxe Model; 4.All singing; all dancing Model.	Main collaborator is a housing company; one recommendation is to have greater involve-ment of housing sector.

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Gritzalis D, Lambrinoudakis C. A data protection scheme for a remote vital signs monitoring healthcare service. 2000, Medical Informatics, 25(3): 207-224. **Greece**	Descriptive Study (Risk Analysis review)	1.Presents the architectural & functional model of a remote vital signs monitoring service, together with a Data Protection Scheme formulated by assessing and prioritizing the security measures derived by a risk analysis survey. 2.Builds on the existing experience on similar schemes developed for different domains & applications.	References the VITAL Home project using a remote vital signs monitoring service; "key persons of the service provider"; provided input through interviews & questionnaires	Focus on the risk analysis review performed to identify security measures to be implemented prior to its operation & in order to obtain the required license according to the Greek Data Protection Act for maintaining & processing sensitive information. Risk Analysis method applied is the CCTA Risk Analysis & Management Methodology (CRAMM)	Sensitivity of the information stored & processed by this HIS imposes essential requirements for security. Presented step-by-step the use of a risk analysis method for calculating risk levels and for managing risks through the selection of appropriate security measures. Identified the most important needs to be: 1.Authenticated use of system resources; 2.Software quality; 3.System reliability & 4.Availability of electric power. List of security measures derived for the remote vital signs monitoring service; categorized as: -Organizational; -Procedural; & -Technical Security measures that are analogous to the identified system risks.	Applied the CRAMM Model to analyze a specific situation. Logical follow-through. Conclusion relate to objectives.

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Williams G, Doughty K, Bradley D. Safety and risk issues in using telecare. 2000, Journal of Telemedicine and Telecare, 6(5): 249-262. **UK**	Descriptive using a Case Study	Proposes a safety classification system for telecare devices leading to a range of guidelines that represent good practice. Risk assessment techniques are described under in 3 categories: 1.Environmental factors; 2.Human Factors (client & carer); & 3.Technological factors.	Vignette of an elderly patient (Mrs A) who represents an amalgamation of needs of several real clients who are elderly. Refers to a 3 year funding program in the UK to encourage local authorities to develop strategies and methods of risk assessment that prioritize resources for clients who are at most risk of losing their independence.	Modular Intelligent Domiciliary Alarm System (MIDAS) built on the CarerNet Model with its local intelligence, distributed smart sensors & built in self-testing. Range of prototype smart devices developed for use with MIDAS are undergoing trials in a test apartment & at several other sites in the UK.	Telecare systems enable many individ-uals to remain at home safe in the knowledge they have a safety net if anything goes wrong. To ensure a safe & reliable service, the components making up the TC system must be safe & reliable i.e., people, devices, software. It is possible to extend the functionality of current community alarm systems by building suitable intelligence into the devices themselves. True closed-loop TC with integrated services and complex data analaysis Integrity should be maintained at all times in a good second-generation system i.e., able to detect faults in its own operation and inform the appropriate service personnel (or client) asap. Potentially hazardous situations can be controlled with a relatively simple approach.	Low. In depth description of safety issues & their specific risk management techniques, task analysis framework to identify human errors, risk classification system, hazard severity categories for telecare systems & guidelines for the allocation of safety integrity levels for telecare products. Applied these factors to a case study but only framed a partial hazard and risk analysis with possible solutions for the case study. Described a process Unable to assess quality of design & analysis. Discussion but no conclusions cited.

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Albright K & Slater S. Medical Devices In the Home: Present and Future Applications. July 2000, CARING Magazine; 36-40.	Case Report ***(? If this one should be included; it seems more like a non-academic overview)***	Described commonly used devices in home care e.g., - BP/Pulse Meter -Digital Thermometer -Digital Scale -Portable ECG monitor -Glucometer -Pulse Oximetry -Stethoscope -Peripheral Cameras -Spirometer, & -others	78 y.o. female with congestive heart failure (CHF); discharged after 5 day admission to hospice; 3rd admission in 6 months. Mention of a diabetic patient as well; Lives 2 hours away from caregiver; needs insulin checked	Placed into the CHF disease management program i.e., traditional visits will be augmented with TM visits. Use televideo equipment for the nurse to dial into her home to view the patient's insulin syringe using a peripheral camera device.	Claim that for these 2 services, the agency saved staffing time and financial resources and that the patient remains satisfied. Cited doctors, engineers & scientists working together at University of Rochester in NY to design new personal medical devices to help people monitor their own health. Cited Robert Wood Johnson Foundation Report (2000) listed TH & remote monitoring to be one of the 4 big effects in health care & proposes 3 main trends of case management, patient information systems & remote telemetry will link up in their use of interconnecting technologies.	Low. Interesting but no data to support assertions. Unable to assess quality of design & analysis.

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Chepesiuk, R. Making House Calls: Using Telecommunications to Bring Health Care into the Home. Nov 1999, Environmental Health Perspectives. 107(11): A556-A560. **USA**	Overview	Providing health care in homes	None but refers to people around the world needing health care with the focus on care in the home. Quotes Dena Puskin, Director of Health Resources and Services Administration's Office for the Advancement of Telehealth, MD & Doug Perednia, President of the Association of Telemedicine Service Providers (ATSP).	Internet (computer technology) Wireless & Satellite telecommunications E-mail Live audio & video – all which have led to major innovations in the nature & delivery of health care that will have broad implications for the way people receive health information & treatment in the future; especially to rural and under-served populations.	Challenges include: -Reliability of advice through the Internet; -Privacy & Confident-iality of patient/user information; -How to cover the cost of providing on-line health care & -How to overcome the 'patchwork state medical licensure system'. Cost to set up a TM unit has decreased from \$300,000 to < \$50,000 in past few years. However, insurers don't reim-burse for video consultations or TC costs. Estimate that TM would cost Medicare \$50 m more annually but a bill currently before Congress to reimburse for patients in rural 'health professional shortage areas', expand eligible geog-raphic areas & clarify eligible services. Using the Internet to connect HCPs, & patients could create a market worth \$10 billion annually.	Low Primarily a think piece. Unable to assess quality of design or analysis.

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APPENDIX P: CRITIQUE POLICY

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					TM is still in its infancy but is expand-ing in both diversity & delivery. Major fields using TM include: -Radiology -Ophthalmology -Cardiology -Pathology -Dermatology (becoming web based) -Patient Monitoring at home (telephone +) -Prison Systems to reduce transport costs & reduce danger to civilian population & -Delivery of health care to military work-ers in remote areas.	

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Ruggiero C, Sacile R, Giacomini M. Home telecare. 1999, Journal of Telemedicine & Telecare, 5:11-17 **Italy**	States it to be a review article but provides an overview of tele-homecare.	Providing health care in homes.	None directly but refers to people requiring care in their homes; specifically to the vulnerable e.g., the elderly to assist them with the activities of daily living & care of specific medical conditions such as: -Diabetes -Hypertension -Motor disabilities.	Tele-alarms for safety & security & monitoring devices to assess functional health status for simple but important measures e.g., mobility, sleep patterns, utilization of cooking facilities and of the bathroom.	Home health care is one of the fastest growing areas of health care delivery. Technical solutions must be acceptable to both the health care staff & the assisted person; should supplement, not replace, human carers. Found other important aspects to be: -Simplicity of operation & management; -Availability; -Reliability; -Affordability. Timely & CE inter-vention of medical & community-based services will diminish the demand for high-cost medical services, helping to contain & reduce costs of providing health-care services to the elderly. General lack of formal studies on CE.	Low. States it is a review article but does not address related literature specifically. Therefore, unable to assess quality of design & analysis.

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					From commercial perspective, they are worth considering if: -High % of population is involved to reduce unit costs; or -Population is spread over a large region where communica-tions by road are difficult so Telehealth is cheaper than direct assistance; or -Need for continuous monitoring. Barriers: -General crisis of national health care systems; -Technical difficulties of integrating different devices at home & at the monitoring centre & -Need for introducing & testing tx plans different from those currently used by physicians.	

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Celler B, Lovell N, Chan D. The potential impact of home telecare on clinical practice. 15 November 1999. MJA, 171: 518-521 **Australia**	Academic Overview	Provision of homecare	None but refers to at-risk elderly & people with chronic diseases.	Telehomecare 1st, 2nd & 3rd generation devices, telephone, Internet & web to provide monitors and alarms.	Look at 3 areas of homecare need: -Prevention -Health Maintenance -Health Support Concluded that: Telehomecare will allow for increased capacity for self-management but that it will require funda-mental changes in every sector of health care requiring a paradigm shift among clinicians & the active involvement of medical colleges, academic institutions & government. Suggest that implementation of homecare will be limited by inertia & resistance to change with the health care system; not by the technology.	Low Unable to assess quality of design & analysis.

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Dansky K, Bowles K, Palmer L. How Telehomecare Affects Patients. August 1999. CARING Magazine: 10-14 **USA**	Program Evaluation	Partnership between: Pennsylvania State University, The Visiting Nurses Association of Greater Philadelphia (VNAGP) & American Telecare Inc. for a telehome-care project to provide care to diabetic patients in their homes.	Diabetic patients who are discharged from the hospital & referred to VNAGP.	Patients randomly assigned to intervention group who receive skilled nursing visits + video visits or control group who receive nursing visits only. A standardized clinical pathway is used for patients in both groups. 9 nurses from the VNAGP specially selected for the project; received 3 day training program. Modified SF-36 used to collect data to evaluate changes in health status & satisfaction.	Preliminary analysis found patients to be very satisfied & that even frail & elderly people can use the equipment effectively with practice & encouragement. Negative feedback related to: -Home issues e.g., amount of electricity used & amount of space for equipment; & -Technical issues e.g., jerkiness of picture. Simple instructions & a manual left in the home were helpful.	Moderate Overview of study & summary of preliminary findings presented. Unable to assess quality of design & analysis.

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Wheeler, T. Strategies for Delivering Tele-Home Care – Provider Profiles. Aug 1998, Telemedicine Today, 6(4):37-40. **USA**	Overview	Overview of individual companies offering tele-homecare technology and the way they are integrating new technologies into service-delivery programs.	Focus on Telenursing	Creating/using a variety of technical tools that will replicate the capabilities of the acute care setting without acute care costs e.g., IV infusion pump in the home with the nurse using a laptop computer to hook up the pump to the voice-over-data modem to monitor the infusion, reprogram it, or download data while she is talking to the patient. Home voice & video system with an ordinary TV &POTS with select medical peripherals together with a multidisciplinary team & approach to manage chronic diseases e.g., heart disease, diabetes, asthma, HIV & COPD.	Suggest the real key to success is creating the right system of solutions rather than any one technological tool. With approximately 52 million homecare visits/yr &total health care costs exceeding $1trillion, speculates that TM easily represents a $ billion business & multiples of that in savings to the health care systemSuggests that the critical success factor will be redesigning the how care is delivered while main-taining or improving the quality of care. Suggests an increase in efficiency/ product-ivity for home nursing e.g., increase from 5 or 6 in-home visits daily to 15-25 telehome visits daily.	Low but interesting information. No research design evident. No references

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Tikhonov C. Tele-homecare: An Overview. Background Paper for Discussion, May 1998, Office of Health & the Information Highway (OHIH) Policy & Consultation Branch, Health Canada. **Canada** Cites: US & Sweden	Overview (?Program Evaluation;) Homecare programs are defined as programs specifically organized to co-ordinate & provide health care & supportive services to an individual in his or her place of residence.	Health Canada provides a high level overview of telecare in US & Sweden & then describes the known telecare programs in Canada stating what the program is; why it is being provided; by whom & what it is expected to accomplish. "…tele-homecare is a reflection of the increasing level of technological expertise in TM/TH industries, market trends & an increasing social demand for economically viable professional services in a homecare setting. Terms used inter-changeably to identify the use of electronic communication networks for 2-way transfer of information	The various providers of differing tele-homecare devices, software & programs. State most current applications are for patients with: -Cardiac disease; -Diabetes; -Hypertension; -COPD; -Septicemia & -Adverse drug reactions	Telephone systems utilizing software with diagnostic algorithms e.g., Emergency triage (NB, QU, ON) Videophone to allow for 2 way interaction combined with vital signs monitoring device (NB for telecardiology) Data & video ports with multiple medical devices e.g., consultation in f/u to hospital care &/or to replace a visit (NB, ON). The above but with high level doctor involvement to toward a Virtual Hospital: projected savings $190/day; 387 beds at full capacity projected to break-even in year 1; total savings=$26m (ON) Electronic networks to streamline & enhance admin & case management activities to create home health info-structure; conceptualized as a subset of Canadian Health Infostructure (CHI) (NB, ON)	Asserts telehomecare systems have enormous capacity to enhance the delivery of home health care (e.g., improve access to care & increase responsiveness of health care facilities to changes in vital signs) & to lessen the economic burden of illness in Canada e.g., service cost of $25-35/day. Does not provide current costs. Need for careful patient selection i.e., -Possess enough cognitive ability, hearing & vision to use the system or have an informal caregiver provide assistance; -Disease be stable; -Patients have a (+) attitude toward technology; & -Be trained in use of technology. Issues: -Reimbursement; -Liability; -Staff resistance (one of highest due to perception of threat to jobs, negative impact on nurse-patient relationships) -Lack of standards; -Client acceptance.	Overview of literature

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		& data required for medical dx, tx, consultation, &/or health maintenance between a patients' residence & a health care facility are: -Personal TM -TH homecare -Tele-homecare & -Telecare.		Comprehensive, multidisciplinary, integrated home solutions (NB, MB, NB, ON)	Nurses acceptance increased by seeing positive response by patients & increased flexibility in schedule. Tele-homecare is in its infancy but the emergence of industry champions, despite lack of funding, is encouraging.	

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Hayes R, Duffey E, Dunbar J, Wages J, Holbrook S. Staff perceptions of emergency and home-care telemedicine. 1998. Journal of Telemedicine and Telecare, 4(2):101-107. **USA**	Evaluation Study (Pilot/**qualitative** study)	Provider role/care to patients in pre-Emergency, Emergency Department (ED) & in their homes.	Project Coordinator, ED Medical Director, ED nurses who worked on same shift as Medical Director, Emergency Medical Technicians (EMTs), & 1 Home Health Agency (HHA) nurse from each of 5 area offices. Focus of study on ability of the system to meet a health care need in the ED & home care settings, & on the organizational factors creating barriers or facilitating optimum utilization.	Low bandwidth TM System (2 portable & 2 base units).	Initial enthusiasm of nurses, physicians & EMTs was not followed by the commitment of their administrations to the system use e.g., lack of communication & collaboration between leadership & HCPs. In the HHA, policies regarding nurses' time expenditure discouraged use of the system. Results of this pilot support previous observations that if TM is introduced in a series of demonstration projects rather than as an integral part of an organiza-tion's strategic plan, the probability of success decreases significantly. Barriers in ED: -Lack of admin commitment; -Scheduling of system by HHAs; -Physician misgivings -Portability of equipment. Benefits in HHA: -Able to treat; -Avoided transport -Able to visualize patients condition.	Moderate; small sample size Project team conducted pre-project interviews & struct-ured interviews at 2-3 week intervals. Conducted a site visit to confirm reliability & validity of data & obtain further relevant information. Used content analysis to derive themes by evaluator & independent reviewer. Reliability: compared responses in follow-up interviews to the final stage interviews. Validity: compared final site visit responses to observations of project coordinator.

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Fisk M. Telecare at home: factors influencing technology choices and user acceptance. 1998. Journal of Telemedicine & Telecare, 4(2): 80-83. **UK**	Think Piece related to ethics	Provider and user roles.	None but refer to the elderly who live in their homes.	Use of personal response systems - sensors (primary i.e., installed in the home or secondary i.e., carried, worn or implanted) or smart systems, or the telephone. Sensors are viewed as a potentially better option than locked doors, restraints or sedation by medication.	Philosophical position that control & choice must underpin the way Telecare technologies when their application is considered in the home as ones' home is considered the most powerful symbol of independence. Telecare is partially driven by public sector imperatives to direct resources to those with most acute medical needs. Conclude that non-acceptance & non-use is partially related to failure of designs & operational procedures to respond to wishes & feelings of the elderly.	Low. Unable to assess design quality or analysis.

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Ostbye T & Hurlen P. The Electronic House Call: Consequences of Telemedicine Consultations for Physicians, Patients & Society. May/June 1997. Arch Fam Med, 6: 266-271. **Canada & Norway**	"Special Article"; Think Piece	Provider role; futuristic thinking of possibilities & changes in provider role. Definition used: "TM is TC that connects a patient & a HCP through live 2-way audio, 2-way video transmission & that permits effective dx, tx & other health care activities" p.266.	None; refers to PCPs, Specialists & patients around the globe.	Primarily TC and the Internet to provide an "electronic house call" i.e., combine best aspects of regular house call & office visit. Will require physicians to have electronic access to medical records & to a global reference library – all without patients having to leave the comfort of home [possibly will apply for physicians as well] Discusses implications of the widespread use of TM among physicians, patients & society as a whole; focuses on the 'electronic house call' communication between physician & patient. Explores the new type of physician: patient relationship & broader economic, legal and political consequences of widespread use of TM.	Over next 10 yrs., expect technology to be widely available in homes & physician offices, have a major impact on the way health care is delivered and be an integral part of the health care system due to increase in information & decrease in cost of computers & TC equipment. Possibility of markedly changing ways physicians practice i.e., physicians & patients may be located on different continents or develop new International health centres. Concluded with a question i.e., "Will TM lead to improved health & access to better health care or …widen differences that already exist?" p. 270.	None apparent.
Cooper M & Keating D. Implications of the emerging home systems technologies for rehabilitation. 1996. Med Eng Phys, 18:176-180. **UK**	Overview Adapted information from the European TIDE Project HS-ADEPT (Home Systems – Access for Disabled and Elderly People to this	Rehabilitation Provider Role & implications of the technology for rehabilitation in the home.	Refers to patients requiring rehabilitation; specifically the elderly & disabled people, and their carers.	Integrated Home Systems (generic term for Home Systems, Smart Houses & Intelligent Homes) to monitor and assist individuals with independent living.	Need to consider the implementation of technologies based on individual's needs & choice & in the wider social context e.g., increasing independ-ence could create greater social isolation for disabled individuals if carers become replaced with technology.	Refers to drawing information from TIDE Project. Unable to assess design quality or analysis.

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Heather R. Electronic House Calls. March 1994. American Demographics: 6. **USA**	Special Article	Telemedicine to bring provider and user together.	None but gives examples of scenarios for use of TM	Telemedicine; especially to link rural & tertiary sites.	"Telemedicine puts knowledge where it is needed". Argues that TM can markedly decrease cost & patient travel, increase access & improve the quality of care especially for rural patients given the rapid closures of hospitals in the US. Greatest barrier to use is the lack of insurance reimbursement.	Low. Think piece; probably to provoke discussion. Unable to assess design quality or analysis.

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Mental Health						
Lessing K & Blignault I. Mental health telemedicine programmes in Australia. Journal of Telemedicine and Telecare, 2001, 7(6): 317-323.	Program evaluation Did not attempt to address CE.	Program Utilization	Mental health clients Survey of 23 MH programs. 36 programs active but another simultaneous study involving 11 of those programs was underway & to avoid approaching the same people twice, the remaining 25 were asked; 23 responded; response rate of 92%.	Questionnaires to State &/or local managers to collect a large quantity of similar information from a geographically dispersed group. It was divided into six sections: -Catchment area; -Overview (funding sources, human resources & policies); -Technology; -Clinical Activity; -Other Activity e.g., education. admin, family contacts; & -Additional questions	In 1999, 36 mental health (MH) programs Mental Health TM programs are making a contribution to the implementation Australia's mental health policies at both the Commonwealth & State levels which enshrine the right to timely & high-quality mental health care delivered in a manner conducive to continued client participation in community life; based on principle of equit-able access to approp-riate mental health services where/when they are needed. Overall number of clients using the programs is low i.e., ave. 123 sessions of direct clinical care/ program/year. Majority of clients were from rural communities.	High. Methodology clearly outlined; Analysis plan & process explained; Ethics approvals included; Conclusions linked to objective; Well referenced.

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APPENDIX P: CRITIQUE POLICY

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Teleradiology						
Crowe B. A review of the experience with teleradiology in Australia. 2001, Journal of Telemedicine & Telecare, 7(Suppl 2): S2:53-54. **Australia**	Academic Overview	Approach to referrals & use of teleradiology in the private & public sectors of Australia.	Inferred that Radiologists & Patients receiving teleradiology (adult & pediatric).	Teleradiology: Plain films CT Images MRI Images	There has been considerable interest in the use of Teleradiology due to the geographical dispersion of the Australian population i.e., 25-30% of the 20 million total population live outside metropolitan areas. Provision of teleradiology in private practice has been successful. There have been some notable successes, but progress has been slower than expected in publicly funded, state-wide teleradiology services despite enthusiastic support for it in the early 1990s. Time lag of 10 years should not necessarily be viewed as a failure.	Cited a number of teleradiology programs and their respective services but unable to assess quality of design & analysis.

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Author / Article Title / Journal / Year / Country	Study Design	Modality	Participants:	Intervention / Exposure	Outcomes / Socio-Economic Indicators	Strength of Study
Gulube S & Wynchank S. Telemedicine in South Africa: success or failure? 2001, Journal of Telemedicine & Telecare, 7(Suppl 2): S2:47-49 **South Africa**	Academic Overview	Provider role	Inferred radiologists, GP's, patients using radiology services. Mention of administrators as well. 3 provinces, each with a tertiary centre & radiologist serving 3 rural district hospitals. Average of 200 kms between rural & tertiary sites with a population of 3-4 million/province. Radiographs typically reported by GP's with approx 10% sent to Radiologist due to limited number/ accessibility of radiologists.	Review of first year activity of teleradiology in South Africa. 1 province from Jan-Sept 2000, 264/2663 radiographs selected for specialist reporting: -Spine trauma 32%; -Chest diseases 28%; -Chest trauma 15%; -Extremity trauma 13%; -Head trauma 10%. 2nd province June-Aug, 9 antenatal care Teleultrasounds; avoided 4 transfers. Also operated a flying doctors program of monthly visit to specific areas.	Able to improve access to Radiologist reporting in 10 remote sites in 3 provinces. PCPs were able to access Radiologist reporting in 1 hour vs. a typical 5-7day delay when radiographs are transported by road. Improved ability to of doctors in remote areas to dx & manage various medical conditions including trauma & chest diseases. Assisted in moving the antenatal u/s services from provincial referral centre to the remote/ rural community health centres. In doing u/s in the r/r centres, clinicians noted success in: 1.training HCPs in use of u/s for prenatal care & 2.providing dx & management for complicated pregnancies. Reduced professional isolationism. Failures of TM: -Technical problems & -Human organization issues e.g., radiologists reporting via fax or e-mail. Low usage raised questions about CE	Low Unable to assess quality of design & analysis.

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APPENDIX P: CRITIQUE POLICY

Author / Article Title / Journal / Year / Country	Study Design	Modality	Participants:	Intervention / Exposure	Outcomes / Socio-Economic Indicators	Strength of Study
Report of Working Group 3 Medical Imaging Technology Roadmap: Transmission & Connectivity, March 30, 2001. http://strategis.ic.gc/imagemed Published & distributed by Industry Canada on behalf of Medical Imaging Technology Roadmap Steering Committee. **Canada**	**Program evaluation? Exploratory Study? This is a report creating new information.**	Working Group to identify & describe key issues that need to be addressed & enabling technologies that need to be developed to fulfill future patient and market needs with respect to transmission & connectivity.	Medical Imaging Technology Roadmap Steering Committee, 2001; representatives from corporate sector & research community.	Medical Imaging	Report addresses: -Professional Issues; -Technical Issues; -Ethical Issues related to TH. Enormous potential for transmission & connectivity in medical imaging to parlay technology advances into a more efficient & successful health care system. Health services in CA are delivered within a multilayered policy structure that extends from global to patient/ practitioner level. The current situation is unclear & untenable as it exposes patients & practitioners alike to substantial, unnecessary risk [legal/ethical].	**Probably high ?** due to the cross-section of members of the working committee and the process undertaken to provide new information. Unable to assess quality of design & analysis. Drew from existing literature, knowledge & experience to create a new working paper for Industry Canada.

Author / Article Title / Journal / Year / Country	Study Design	Modality	Participants:	Intervention / Exposure	Outcomes / Socio-Economic Indicators	Strength of Study
Ashcroft R, Goddard P. Ethical issues in teleradiology. The British Journal of Radiology, June 2000, 73: 578-582. **UK**	Review Study **? opinion/think piece**	Ethics of providing Teleradiology service	Focus on Radiologists but refers to other clinicians & patients.	Ethical & practical issues e.g., -Confidentiality; -Data security; -Technological reliability; -Consent; -Competence; -Inter-professional relationships; -Professional-patient relationships; & -Organization of medical services.	Ethical issues are raised stating that the ethical status of TM; particularly teleradiology is unclear at present due to dearth of good quality technology assessments & due to the complexity of the legal situation regarding contractual agreements, patient & institutional control of confidential infor-mation, consent, & professional compet-ence especially in the international arena. If quality of care is not compromised & patient's rights are protected, TM holds prospects for ethical improvement in health care through a more CE/efficient system. It advantages are there, then there is an ethical imperative to try to use TM.	Low. States it is a review article but unable to assess quality of design & analysis. Well referenced.

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Miscellaneous						
Noorani H & Picot J. Technology Report: Assessment of Videoconferencing in Telehealth in Canada, Canadian Coordinating Office for Health Technology Assessment (CCOHTA) May 2001. No 14.	Program evaluation	1. To provide decision makers within the Canadian HC system with broad-based information about the collective experience of TH v/c programs. 2.To provide decision makers with evidence regarding outcomes from the use of v/c technology in terms of patient care, distance education, training, user satisfaction & communication patterns. 3. To suggest directions for the future through a retro-spective view of what has occurred, or not occurred, in v/c in CA over past 20 years.	Key stakeholders from 8 TH v/c systems in Canada; 2 territorial & 6 provincial.	Telehealth programs offering a variety of applications; in a state of transition between pilot project & program status. Most programs are expanding. 8 programs reach ~150 sites. Synthesis of survey responses & project evaluation reports. Literature review of > 270 articles & reports over past 2 years; 40 selected as primary outcome studies. Extensive review available in appendix. 23 primary studies compared impact of teleconsultation with FTF care: Mental health (9); Dermatology (6); others (8).	# of sites covered by v/c is small compared to size & population of Canada. Establishing systems for patient care using v/c is feasible but little evidence from literature of clinical or economic benefit re-garding CE compared to FTF care. All programs surveyed reported some (+) results e.g., -Improved communications between colleagues; -Better access to care; -High level of PS. Unresolved issues: -Reimbursement; -Human Resources; -Nationally approved standards for training, education of operators or site coordinators; -Organizational changes & -Medico-legal issues e.g., licensing, credentialing, accreditation, privacy & confidentiality.	Strong. Outlines methodology and follows it; includes detailed information in appendices e.g., consent to participate; questionnaire; extensive literature review analysis. Well referenced.
					Shows growing acceptance of TH by HCPs & patients. Network transmission methods & bandwidth similar among programs. Implementation patterns varied.	

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Oakley A, Rademaker M, Duffill M. Teledermatology in the Waikato region of New Zealand. 2001, Journal of Telemedicine and Telecare, 7(Suppl 2):S2:59-61. **New Zealand**	Review of previous trials	Teledermatology (TD)	Reference to GP's in rural areas, dermatologists & patients referred for dermatology consultation.	Began pilot tests with Interactive Video in Waikato, in collaboration with UK to participate in UK Multicentre Tele-dermatology trials to evaluate clinical & cost effectiveness. NZ later adopted the Internet as information source & routine communication. Interest in Internet led GPs to seek advice via e-mail; led to offering secure browser-based dermatology tele-advice service to referring GPs to broaden referral base. 5 rural GPs with digital cameras invited to access browser test site for store & forward applications.	Clinical trials demonstrated dx was possible in > 75% of patients. TD clinic scheduled monthly for >5yrs; majority of consultations satisfactory; savings in time & money for the patient but not to the system; >10% non-attendance & several patients request FTF follow-up visits. GPs enthusiastic about service & educational gains. Despite this success, few patients have access to v/c facilities. Pilot service has continued out of loyalty to participants & communities who appear to value it but it is not funded nor supported with a business case. Found dx & management can be done in >50% of cases using a referral letter & digital still images which resulted in the teleadvice S/F TD service; resulted in minimal interest by GPs & service only used for a small number of test cases. Few visits to web site & did not attend FTF training session.	Moderate Relates to other studies and provides an overview of RCTs and other trials along with evaluation findings. Methods refer to equipment & TC modalities used. Unable to assess quality of design & analysis.

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					May be due to time as use dial-up modems + reimbursement issues.Yet Dermatologists with published e-mail addresses receive requests for consults from all over the world but do not provide on-line service. Found TD unreliable in dx small skin lesions, rashes in small children & genital eruptions. Minimal clinical interest but v/c used daily for admin & educational purposes. Non-attendance is true for both FTC & TD consults; possibly due to poverty, apathy & lack of transportation.	

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Author / Article Title / Journal / Year / Country	**Study Design**	**Modality**	**Participants:**	**Intervention / Exposure**	**Outcomes / Socio-Economic Indicators**	**Strength of Study**
Sinha A. An Overview of TM: The Virtual Gaze of Health Care in the Next Century. 2000, Medical Anthropology Quarterly, 14(3): 291-309 **USA**	Academic Overview	Anthropological perspective of TM.	Refers to patients, HCPs, administrators. Focuses on: -Changing corporate structure of health care & political attitudes toward TM; -Documents the current use of TM in prisons, military & cross-cultural settings; -Discusses responses to TM of individual physicians, HCPs, & patients.	Discusses 3 theoretical concepts: 1.Foucault's "medical gaze"; 2.Political economy of health; & 3.Deterritorialization & multi-site ethnography.	That responses are broadly conditioned by an individual's mode of articulation with biomedical institutions & that they are mediated by individual personal experience. ICT's have been instrumental in changing the power base from physicians to corporations [suggests it should go on to patients] & have become the tools through which power is re-negotiated. Foucault's gaze is becoming a virtual gaze rooted in technological & bio-medical contexts. States cross-cultural records have demonstrated healing is dependent upon relationships; therefore that some of the functions of healing relationships e.g., glucose monitoring can be done via TM but that TM will fail if doctors try to re-create the frayed physician/ patient relationship remotely, that TM will fail. Exception: specialist care due to its unavailability in remote areas.	Low Well referenced. Academic overview. Unable to assess quality of design & analysis.

Author / Article Title / Journal / Year / Country	**Study Design**	**Modality**	**Participants:**	**Intervention / Exposure**	**Outcomes / Socio-Economic Indicators**	**Strength of Study**
Lange R, Indelicato D, Rosen J. Virtual Reality in Surgical Training. Surgical Oncology Clinics of North America. January 2000, 9(1):61-77. **Authors from Germany, Lebanon & USA**	Academic Overview	Surgery: -Training & -Performing	Surgeons	Virtual human; specifically a virtual reality surgical simulator; potential creation of a virtual human and explores the uses e.g., planning surgery, surgical training & objective measures of student learning.	Telesurgery predicted 35 years ago by R. Mann. Now many systems for telesurgery/tele-presence are currently being tested. Biggest hurdle is designing an improved model of the human body for virtual reality surgery & the tools to interact with this model. Virtual human body is central to medical field but also has uses for crash testing, military for ballistics research on tissue injury & commerce for ergonometric design. Key lesson learned: virtual reality enhances training but does not replace the existing methodology. The future will have computers involved in training surgeons as well as in the planning of surgery & aiding performance in the OR.	Low Focused overview. Well referenced. Unable to assess quality of design & analysis.

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Riva G & Gamberine L. Virtual reality as telemedicine tool: technology, ergonomics and actual applications. Technology and Health Care. 2000, 8: 113-127. **Italy**	Academic Overview	Surveys the state of the art in TM applications & virtual environments & related technologies for health care.	Refers to a variety of clinical applications by HCPs for adults &/or children.	Virtual Reality (VR) i.e., an application that lets users navigate and interact with a 3-dimensional, computer generated environment in real time; & Virtual Environment (VE) is an interactive, virtual image display enhanced by special processing & by non-visual display modalities such as auditory and haptic, to convince users they are immersed in a synthetic space.	VR considered as the leading edge of a general evolution of present commun-ication interfaces like TV, computer & telephone; could have a strong effect on health care. Lack of Controlled Clinical Studies showing any significant advantage over traditional methods. Emerged in non-medical areas 1st e.g., entertainment. Several possible applications; most promising is surgery. Key issue is safety e.g., less than 10 minutes of exposure can create ocular problems, disorientation & nausea. Technology is improving; costs are falling. Legal issues regarding relationship between: -Clinician & patient; -Clinicians; -Provider of TM system & user. Other obstacles: -Acquiring funding for untested treatment modality; -Reference Standards; -Relative lack of familiarity with technology by researchers in field.	Low to moderate. Tightly referenced. Academic overview. Unable to assess quality of design & analysis.

Author / Article Title / Journal / Year / Country	Study Design	Modality	Participants:	Intervention / Exposure	Outcomes / Socio-Economic Indicators	Strength of Study
Schiffman J & Tang R. Information Technology in Ophthalmology: Extending Your Ophthalmic Expertise and Your Practice. June 2000. Ophthalmology Clinics of North America, 13(2): **USA**	Overview	Ophthalmology	Ophtalmologist; refers to people with varying eye problems	Interactive v/c S/F Mode (data, still images, voice or audio clips or dynamic images. Hybrid System i.e., combination of v/c & S/F. Basic TC lines Internet	Provides an overview of TH in Ophthalmology. Believe that increased Internet availability & TC speeds, that TM (including v/c) will be done over the Internet. Eye care is well suited to TM. Discuss the technology; provide a framework for starting the service & then review a number of eye diseases with opinions about the use of TM for each. Note there are no technical standards & the need for color to be clear/accurate in dx eye conditions. Concerned about sustainability once grant funding is completed in several programs.	Provides a good overview; referenced. Unable to assess quality of study design & analysis.

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Mitchell J. Increasing the cost-effectiveness of telemedicine by embracing e-health. Journal of Telemedicine and Telecare, 2000, 6(Suppl 1): S1:16-S1-19. **Australia**	Program evaluation [National study of TM in AU]	Premise for report prepared for the AU government: TM needed to be integrated with conventional health if the full benefits of TM were to be realized. Led to definitions of TM, TH, Health Informatics, Information economy, e-commerce & e-health. Used e-health as a general term to describe the use of both TC & IT for the delivery of health services both at a distance & locally.	Range of HCPs and recipients in a variety of IT/TC programs. Presentations & discussions at 5 national workshops held to discuss the findings of the original report on TM. Nineteen case studies were identified Internet searches Literature review	Range of initiatives in the AU health sector that involved combinations of TM & IT: -Rural nurses making house calls using lap top computers capable of connecting to databases via a mobile phone. -Highly qualified cardiology staff answering phone calls from around AU in the Adelaide call centre at the National Heart Foundation, with the support of a powerful database. -Renal clinicians v/c to assess local clinical databases. -Radiologists using a combination of teleradiology & digital archiving systems. -GP;s accessing powerful new pharmacy data-bases & producing electronic scripts. Case Studies involved the use of TC technologies e.g., v/c, telephone & Internet; with IT e.g., computer databases & image capture, electronic ordering, storage & retrieval systems. Internet case studies using combined IT/TC: -GP's communicating with hospitals/pharm-acists via the Internet;	CE of both TH & TM improves considerably when they are part of an integrated use of TC & IT in the health sector. Regulatory & behavioural barriers to the successful take-up of e-health in AU: -Concerns re privacy of health data; -Need for technical standards; -Remuneration for HCP's; -Low level of knowledge about IT & TC technologies among HCP's.	Moderate to high. Followed Method described.

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Fitch C, Briggs, Beresford R. System issues for successful telemedicine implementation. 2000, Health Informatics Journal, 6:166-173. **UK**	Overview	Technical aspects of TM	None	TM – Real time, & Store and Forward technologies. Identify principal issues that influence the technical aspects of TM Systems.	Skills in both IT & health/social factors are required to achieve success in TM. Suggest that insufficient under-standing of each other's field may lead to projects not working as well as expected or abandon-ed prematurely. Rapid development of technology may over-shadow organization-al &societal aspects of TM applications. Identified & discussed the follow-ing common issues: -Reliability & availability; -Usability; -Security & confidentiality; -Efficiency; -Interoperability, integratibility & conformity; -Portability & configurability; -Capacity & scalability; -Maintainability. Barriers identified: -Medico-legal; -Ethical issues; -Clarification of the responsibility for funding.	Low Unable to assess quality of study design & analysis. Minimal references.

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Lehoux P, Battista R, Lance J. Telehealth: Passing Fad or Lasting Benefits? July-August 2000. Canadian Journal of Public Health, 91(4):277-280. **Canada**	Academic Overview/ Think Piece Based on a report prepared for the Conseil d'évaluation des technologies de la santé du Québec.	To reflect on the processes by which TH applications do or do not contribute to the delivery of health services and indicate aspects that require further investigation.	None	Propose a framework structuring a preliminary analysis of the match between needs and the possibilities offered by TH. The 4 mechanisms of potential benefits are: 1. Decreasing patient transfers 2. Decreasing trips by providers & patients 3. Meeting the needs of underserved populations 4. Building providers' & patients' knowledge & reducing rural isolation.	Added a 6th principle i.e., 'needs assessment' to Wootton's 5 principles for TH i.e., evidence based practice, appropriate risk management, proved CE, maintenance of equity in provision of health care & HCPs in future development. Discuss the perspectives of those who advocate TH & those who have competed pilot projects but have not sustained TH. Emphasize participation of providers in research on TH and in steering the evolution of TH; especially providers in remote areas who can identify what they need to support their work & be responsive to community health needs.	Moderate Extensive literature review & synthesis of the information with the development of a new framework. Unable to assess quality of study design & analysis.
Schlag P, Moesta T, Rakovsky S, Graschew G. Telemedicine: The New Must for Surgery. Nov 1999, Arch Surg, 134:1216-1221. **Germany**	Academic Overview of demonstration projects.	Tele-surgery; surgeon's changing role.	None but refers to surgeons and patients requiring a surgical procedure.	Digitized surgical data with images referring to tissues & TC to transport the images between surgeon and patient being operated on. Highly technical report.	Questions if changes in surgery are a vision or nightmare. If it is to be profitable to patients & society, asks what steps should be taken, which ones should be avoided	Low.

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National Horizon Scanning Centre, The University of Birmingham. New and Emerging Technology Briefing: Surgical Robotics. January 2000. **UK**	Academic Overview	Robotic systems	None; refers to surgeons and surgical patients.	5 broad types of robotic systems with potential for surgical applications-Intern replacements; -Telesurgical systems; -Navigational aids, passive manipulator arms that keep track of tools; -Precise positioning systems; & -Precise path systems.	Explored issues & concerns linked to the development & use of medical robots; summarized key systems being trialed; & discussed each type of system in relation to specific surgical application. Note that the number of systems is still small and, if approved, are being used for research e.g., -Electronically guided knee surgery; -A multi-function robot system for endoscopy; -Robotically enhanced operating theatre. Difficult to assess usefulness at this time.	Low Unable to assess quality of study design & analysis. References appear focused to topic.

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Jukić D& Bifulco C. Telepathology and Pathology at Distance: an Overview. 1999, Croatian Medical Journal, 40(3):421-424. **Croatia**	Academic Overview	Pathologist providing telepathology service	None but refers to pathologists; specifically in Croatia and Europe.	Discuss 2 basic tele-pathology (TP) applications & 'brands': 1.Static Image (SIT); a Store & Forward type technique; relatively cheap, easy to set up & maintain & sufficient for a consultation service. Controlled by sender who decides what part of slide to send; higher legal risk. 2.Dynamic Image (DIT); captures & transmits image from whole slide in real time; gives recipient control of slide; eliminates need for pathologist at originating site; higher cost; complex to set up & maintain but most appropriate for under-staffed areas. Also use transmission by e-mail or low cost video phone e.g., Spain.	Suggest that setting up a laboratory requires defining the needs & then choosing the system wisely to meet them e.g., SIT appropriate for Croatia due to lower cost & fast turn around time not being required. There is no single TP standard to allow flawless & endless communication between TP systems but one attempt to unify standards is to DICOM protocols. State that setting up a database standard would facilitate image exchange & informa-tion warehousing. The standards would then have implica-tions on future TP software & hardware.L egal issues are real but there is 'more concern than decisive action in the field' (p.422).	Low Unable to assess quality of study design & analysis. Extensive reference.

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Angaran D. Telemedicine and telepharmacy: Current status and future implications. July 15, 1999, Am J Health-Syst Pharm, 56:1405-1425. **USA**	Academic Overview; Special Feature	Potential roles for pharmacists using TH	None but refers to pharmacists.	TM. Technologies referred to include v/c, telephones, computers, Internet, fax, radio & TV. They note that the telephone has changed from a 'dial & talk' instrument to a multi-media access tool with ability to attach medical devices for remote monitoring & therapy. Also comment about Call Centres providing medication counseling, prior authorization, refill authorization & formulary compliance monitoring.	Expect TM market to grow; Internet use high but seen to lag behind that of other industries. Consumer expecta-tions for speed, access & convenience through use of the Internet are creating more unmet expect-ations of the tradition-al health care system. Online drug stores are creating most attent-ion of consumers. Benefits include: -Improved access, -Greater efficiency in dx & tx, -Higher productivity, -Market positioning Barriers include: - Lack of reimbursement, -High costs, -Regulatory, legal & ethical issues, & -Lack of clinical care expertise to use TM	Moderate Categorized specifically and well supported with references for each. Unable to assess quality of study design & analysis

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Thrall J & Boland G. Telemedicine in Practice. 1998, Seminars in Nuclear Medicine, 28(2):145-157. **USA**	Academic Overview	Radiologist provider role; emphasis on TM internationally.	None; refers to radiologists, other specialties providing service via TM	Teleradiology (TR) is most common application & the only one with College developed/ accepted standards (DICOM). Other applications cited include (in order): - Cardiology -Dermatology -Psychiatry -Emergency Medicine -Home health care -Oncology. TR techniques now developed for image: -Acquisition -Digitization -Compression -Transmission & -Interpretation. TR applications include: -Service from larger to smaller institutions, -Coverage of outpatient clinics, -Imaging Centres & -Nursing Homes.	Technological barriers are being overcome. Impediments to further development & realization of TM benefits include: -Licensure -Standards -Reimbursement -Confidentiality -TC infrastructure & costs Question if standards are being monitored. Refers to leadership of military & to State & Federal support exceeding $100m; mostly demonstration projects; emphasis on service to rural, under-served areas e.g., improve access & avoid costly duplication of specialties in multiple service areas. Suggest an important national strategy to use the oversupply of HCPs due to down-sizing may be to improve access for the estimated 4 billion underserved people globally through TM	Low to moderate Unable to assess quality of study design & analysis. Extensive references

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Roberts R & Rigby M. The Need for a Holistic View of Telemedicine, Focused on Patients and Society as Prime Stakeholders. B. Cesnik et al. (Eds) MEDINFO 98: Amsterdam: IOS Press: 1204-1208. **UK**	Academic Overview	Argues for a more holistic & integrated view of TM i.e., to ensure technology is 'harnessed' to meet need(s).	None; refers to patients & society.	Generally refers to Information & Communications technology (ICT).	Suggest the principal driving forces for TM to be financial, specialist clinical interest & proof of technological feasibil-ity. States that, patients' views & interests, societal effects, quality controls & wider organizational effects are seldom considered. Describes methodologies to assess patient attitudes & societal priorities. State consideration of TM solely of the technology & immediate application effects is inadequate to the point of being unethical; that "TM has the power to destabilize health care structures, deskill local HCPs & expose citizens to uncontrolled practice, whilst putting system suppliers in a dominant position" (p.1208).	Moderate Unable to assess quality of study design & analysis. Very focused.

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CANARIE Inc. Telehealth in Canada: Clinical Networking, Eliminating Distances. July 1997. **Canada**	Report of the insights gleaned from presentations made at the April 1997 *Telehealth in Canada. Clinical Networking, Eliminating Distances* Conference held in Quebec City.	Report of conference proceedings	150 stakeholders attending the conference from health community, government & private sector.	Forty papers presented addressing many facets of TH across Canada. Conference was a 'showcase' of pioneering efforts, outcomes, experiences and achievements in the development of Canada's Health Iway. New technologies in ICT sector represent $65 billion/yr industry employing > 400,00 Canadians. Trying to make CA be a producer of ICT; not just consumers. CA's use of ICT among highest in the world. Pilot projects reported in cardiology, radiol-ogy, dermatology & psychiatry.	Presented a benchmark for TM in Canada through providing critical perspectives on challenging issues facing those who are building the TH system for Canada & provided a foundation for future collabora-tion, partnering & joint learning. Geography & current fiscal climate to reduce federal & provincial deficits are straining governments to meet rising health care costs (i.e., reduc-ing costs) while improving access & quality of care. TH driven by fiscal constraint & rapid changes in ICT. Challenge for CA is to merge one of the world's best health care systems with an infrastructure that is at the cutting edge of innovation; to change way knowledge of best practices & tx techniques & therapies is collected & shared & in the organization of the system e.g., roles of institutions & HCPs changing to leverage power of new technologies.	Moderate to high as compiled significant information of TM in Canada No study design evident in the creation of the report but referred to various studies.

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					Concluded that TH is still in its infancy & consensus to TH technologies & practices that improve outcomes & quality of care, effective & economical is not yet feasible.	

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Bashshur R. Critical Issues in Telemedicine. 1997, Telemedicine Journal, 3(2): 113-126. **USA**	Provocative Presentation to the second annual meeting of the American Telemedicine Association in Atlanta, GA.	Role of TM in the health care system	None but refers to HCPs, individuals (rural & urban), the health care system, scientists, policy makers and others.	TM States that consensus about the use of TM is neither necessary or desirable; that it is far better to entertain new ideas, new insights & new perspectives than just accepting the prevailing wisdom based on common knowledge. States that evaluation of TM is necessary to assist in answering important questions for policy makers regarding efficient mechanisms for attaining social goals i.e., to inform decisions regarding continuation, modification or termination of programs on the basis of explicit criteria consistent with policy or organizational goals to ascertain acceptance, & effects in terms of costs & benefits. Has found standards for evaluation to be lax & few projects (short or long term) are likely to produce valid results for sound broad policy regarding support for TM systems.	Future of TM secured by forces outside health care i.e., industry, commerce, education, entertainment & interpersonal communication; that technology is outpacing organiza-tion & clinical practice. Cites 4 major sets of issues that present paradoxical choices/ dilemmas i.e., -Technological dilemmas (start with need & apply technology rather than the reverse) -Evaluation paradoxes (objectives i.e., short term is Assessment for policy; long term is competing models); -Contextual hazards (danger of TM creating another tier in medicine; issues of equity; importance of integrated network between urban & rural physicians) -Professional maturation of TM (ICTs are part of everyday clinical decision making, clinical practice & HC management; need to recall how long it took for hand washing, stethoscope, etc., to be integated)	No study design evident. Referenced. Discussed study designs of TM research. Need research to inform decisions but discusses differences between research needed for the scientific community and policy makers, e.g., that policy makers demand prompt answers with som degree of certainty to complex issues, while the scientific community produces complex answers, often lacking certainty to simple questions. Suggests RCTs are deemed to be the best design but all research methodologies are difficult in TM due to

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APPENDIX P: CRITIQUE POLICY

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					Regardless of technological, clinical & organizational design, the more frequently TM is used, the more economically viable it will be e.g., Cooperative model more probable to survive & be CE than the Autonomous one. TM severely constrained by reimbursement policies, limitations on interstate clinical practice, uncertainty about appropriate matches between clinical functions & technology. HCFA not having a written reimbursement policy for TM is essentially stating a policy denying reimburse-ment for any non FTF medical service. Role of federal policy is highly inconsistent e.g., offers grants to develop TM and then adopts a policy denying reimburse-ment except temporary waivers or grant funds.	factors such as small sample sizes & rapidly changing technology, uses & costs plus varying states of maturity and validation of programs. Success or failure needs to be determined based on original objectives. These explicit objectives may no take into account unanticipated factors e.g., -Quality of doctor: patient relationship; -Professional status of referring physicians; -Intensity of care; -Delayed effects e.g., long term changes in health status, geographic distribution of HCPs & resources & economic stability & viability of remote, isolated communities & health resources.

Note: Abbreviations used in this document are described in Appendix D

Author / Article Title / Journal / Year / Country	Study Design	Modality	Participants:	Intervention / Exposure	Outcomes / Socio-Economic Indicators	Strength of Study
Lambrecht C, Canham W, Gattey P, McKenzie G. Telemedicine and Orthopaedic Care: A Review of 2 Years of Experience. 1998, Clinical Orthopaedics and Related Research, 348:228-232. **USA**	Descriptive Analysis	Delivery of orthopedic care	3 orthopaedic surgeons; 410 consultations between Feb 1, 1995-Dec 31, 1996. Hub site with 3 spoke hospitals with adjoining clinic. Mean distance between hub to an individual spoke site =113 miles Mean duration of time was 12.8 minutes.	91 teleconsultations (22% of all consultations); 96% occurred Mon through Friday. Reasons: -Evaluation & tx of fracture care (43%) -Evaluation & tx of ligamentous injury, joint swelling & infection (35%); -Post operative evaluation (18%) -Evaluation & tx of dislocations (4%). Emergent (23%) Urgent (38%) Scheduled (38%) Used VTEL 2-way interactive v/c equipment.	68% of patients remained in rural community. Outcome data revealed no adverse patient outcomes. Satisfactory by surgeons for all consults. Benefits found: -Reduced isolation for patient & HCP in rural areas; -Less travel time for patient, PCP & surgeon; -Potential for rural health care facility viability. Concern areas: -Reimbursement -Professional liability (credentialing, licensure) -Standard of care for TM.	Moderate to strong. Analysis followed methodology described. Outcome measures for both specialists & patients were measured after each visit. Discussion cited conclusions but no conclusion section.

Author / Article Title / Journal / Year / Country	Study Design	Modality	Participants:	Intervention / Exposure	Outcomes / Socio-Economic Indicators	Strength of Study
Weinberg D. How is telepathology being used to improve patient care? 1996, Clinical Chemistry, 42(5): 831-835. **USA**	Academic Overview	Telepathology (TP) provider role	None but refers to those needing pathology analysis/dx	Use of S/F (SIT) or real time v/c (DIT) to transmit images. Estimated to be ~ 60 dedicated TP workstations in the US;	Opportunities for TP: -Meet the needs of underserved communities -Increased funding from government & private sources-Improving TC infrastructure (allows rapid & CE image transmission) -Perceived need to improve access to underserved & rural populations and to eliminate inefficiency & expense of transporting patients to secondary & tertiary sites -Current drive to decrease cost of medical care Using TP may create significant savings to distribute services & expertise among multiple sites.	Unable to assess quality of study design & analysis

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Author / Article Title / Journal / Year / Country	**Study Design**	**Modality**	**Participants:**	**Intervention / Exposure**	**Outcomes / Socio-Economic Indicators**	**Strength of Study**
Grigsby J. Current Status of Domestic Telemedicine. 1995. Journal of Medical Systems, 19(1):19-27 **USA**	Overview	Status of TM in health care.	None	Primarily refer to v/c & S/F but also include videotaping, faxing. Cite 25 or 30 programs active in the US but all have low volumes.	Discusses TM at the beginning of its first stage of development in the early 90's. Refers to previous attempts that were not sustained after initial funding expired. Two main government funders included HCFA & Office of Rural Health Policy. Resurgence of TM due to economic & technological/TC factors that encourage capital investment in this sector. TM is said to represent only a limited change to conventional practice except for changing FTF contact between physician & patient. Can be used for dx, consultation &/or patient management. Review Radiology & TP but believe it is unlimited in clinical use. Barriers include: -Variable, high Long distance TC rates; -Liability -Licensure	Unable to assess quality of study design & analysis

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Author / Article Title / Journal / Year / Country	Study Design	Modality	Participants:	Intervention / Exposure	Outcomes / Socio-Economic Indicators	Strength of Study
					-Hardware/software incompatibility -Absence of standards -Reimbursement -Attitude e.g., political philosophy, concern re lack of scientific validity of TM; perception of TM as a threat (loss of patients, revenue & autonomy)-Behavioral inertia (especially among older physicians who are not computer/ technological literate)	
Alexander M. Telemedicine in Australia. 1. The health-care system and the development of telemedicine. 1995, Journal of Telemedicine & Telecare, 1(4):187-195. **Australia**	Overview	Provider role	None but refers largely to those in rural parts of Australia.	None but refers largely to those in rural parts of Australia. Generally refers to v/c but states that TM would include all uses of TC networks for health care – both direct patient care and for information and communication exchange that is indirect but contributes to patient care.	Cite 6 policy drivers influencing the use of TM: 1.Quality of health care delivery e.g., equality of access , health outcomes movement, best practice identification 2.Federal & state funding & organiza-tion of health care e.g., cost shifting between the 2 governments & having an extensive private hospital system 3.Patterns of practice & TM e.g., Specialist services, General Practice & hospitals 4.TC network e.g., Fibre optics, Internet, TC 5.The Asian connection e.g., for health & education 6.Scientific assess-ment of TM e.g., most studies have concentrated on technical design factors, reproducibility, dx accuracy & acceptability to participants.	Unable to assess quality of study design & analysis

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APPENDIX P: CRITIQUE POLICY

Author / Article Title / Journal / Year / Country	**Study Design**	**Modality**	**Participants:**	**Intervention / Exposure**	**Outcomes / Socio-Economic Indicators**	**Strength of Study**
Maclean J, Brebner J, Norman J. A review of Scottish Telemedicine. 1995, Journal of Telemedicine and Telecare, 1(1):1-6 **Scotland**	Academic Overview	Origins of TM in Scotland in early 1970's. Reviews the past 25 years of TM in Scotland & identifies the principles that have led to success in some challenging locations.	Focus on remote areas. North Sea Exploration involves dozens of drilling & production installations scattered in the North Sea; average population on each =150 with evacuation time ranging from 3-24 hours depending on location & weather. Have paramedics on each rig. Antarctic exploration for 4 permanently manned bases, 1 summer base & 2 ships. Total population in summer ~300 & 60-70 in winter.	Reviewed: -Trauma Care using v/c, teleradiology & telepresence; -Teleradiology, assist in management of neurosurgical patients; -Teledermatology (RCT underway); -TM for maternity services using a portable telemonitor-ing system; includes file transfer, clinical mon-itoring & teleconfer- encing facilities; -North Sea Exploration focuses on injury & illness profile of offshore population & role of communications; -Hyperbaric medicine, multiple interventions for divers; -Antarctic exploration using satellite communication at each base & ship & telephone link between base & UK, use fax; tried slow-scan TV but poor image; -Space exploration "ultimate in remote health care".	Trauma: GP's value the service more than the consultants; edu-cational value also. Teleradiology: eval-uation in progress. Teledermatology: RCT underway. TM/Maternity: enables a direct link between home and hospital labor ward for community based maternity services. North Sea Exploration Anecdotal evidence of improving level of health care to rigs + crucial role of remote & base practitioner education in commun-ication skills to apply the technology. Hyperbaric Medicine: Enhances crisis intervention to include prevention, training, planning, monitoring & reliable voice communication. Antarctic exploration: 4 elements identified i.e., pre-employment medical exam, first aid training, UK specialist advice & medical communications system (latter most important)	Low Unable to assess quality of design & analysis. Highlighted the use of TM as suggested in the title and drew conclusions. Well referenced.

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APPENDIX P: CRITIQUE POLICY

Policy Recommendations	Applicability to Alberta
Appears the process for obtaining health care is made easier with TM, need comparative data to affirm this conclusion. Additional constructs that may affect PS in TM should be assessed e.g., -Travel time & method of transportation -Amount & quality of time the patient spends with the consultant; -Age related valuation of time; -Patient health status, -Physician communication skills, -Medical outcomes & -Interpersonal interactions & skill of the nurse presenter.	Appears to be significant literature on PS but that most of it relies on a simple questionnaire completed post the transaction that may or may not include any demographic data to analyze variables. Although the research findings of the AMHB evaluation appear to be in keeping with these findings, it does seem that more rigorous research on PS needs to be conducted in AB using additional &/or different methodologies that will make the findings more generalizable e.g., for all AB or to rural sites in AB

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APPENDIX P: CRITIQUE POLICY

Policy Recommendations	Applicability to Alberta
Explanation for the contrast between dx & sensitive information given by the oncologist & patients not reporting this in their survey yet referring to the need for this information to be given FTF cited to be unclear & meriting further study. Possibility of patients withholding pertinent information due to nurse [third party] being present is a potential clinical concern & requires further investigation. State it is essential that patient perspectives on the use of TM for health care are understood & acknowledged by everyone involved in order for clinicians to achieve PS & address clinically important issues.	Patients obviously saw an added value to their care with the use of TM and were willing to 'pay [some] price' to have more convenient access. This shows the importance of involving the public in decision making regarding the use of Telehealth for clinical consultation as their perspectives may well assist in making policy decisions

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APPENDIX P: CRITIQUE POLICY

Policy Recommendations	Applicability to Alberta
None specifically mentioned but the need for being open to changing ways of practice may be necessary to effect the use of TH	Be open to changing our ways of practicing to incorporate TH & to have it benefit users.

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APPENDIX P: CRITIQUE POLICY

Policy Recommendations	Applicability to Alberta
Data on objective medical outcome measures important to evaluate to differentiate diagnoses most amenable to treatment by TM consultation. Important to conduct RCT's to compare specific services compared to face-to-face care on patient outcomes & CE	Helps to put local situations and needs in relation to TM in perspective. Provides support data (although flawed) that contributes to better understanding of how others are approaching TM implementation & evaluation; including what not to do.

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APPENDIX P: CRITIQUE POLICY

Policy Recommendations	Applicability to Alberta
Analysis of rural provider behavior is important for its multiple implications for rural health policy. Further research is needed to objectively evaluate TM systems is not one that specifically requires consideration of local conditions. Issues of Licensing & reimbursement need to be addressed; locally & across borders.	Re-emphasizes the importance of looking at context & for the need to look at multiple perspectives of direct & indirect effects of policies.

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APPENDIX P: CRITIQUE POLICY

Policy Recommendations	Applicability to Alberta
State the need for research in a number of areas; also note the research conducted/ documented in the 1970's on basic issues e.g., replicability & reliability of dx, patient response by tx specialty, user satisfaction (patients, referring & consulting physicians). Ask a number of questions that are researchable related to: -Risk assessment; -Development of minimum standards for equipment; -What procedures & consultations can & cannot be carried out effectively & safely; -Therapeutic impact of obtaining consult & dx promptly via TM vs. conventional time; -Legal matters; -Effect on standard of care in isolated communities; -Impact on staff turnover; -Staff training e.g., if it could be provided by TM, could the State be held liable for not providing TM services to improve the situation? To have good research design, must Incorporate measures of risk & cost	Raises a number of thought-provoking questions. Although this paper is 10 years old, most issues are still current and have not been satisfactorily researched or resolved. The notion of an area being held liable for NOT using TH is a 'new twist' and needs to be considered in legal implications of developing new programs & in policy planning.

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Policy Recommendations	Applicability to Alberta
The position of 'help for the needy' has been a staple of those opposed to compre-hensive changes in many social areas. Leaves the article open ended with such questions as: -Does society stop pushing for efforts for the poor e.g., Community Health Centres as that may harm the broader reform needed? Or -Does society take what it can get for the underserved & try to develop a 'patchwork system' of care for the poor thinking that at least the discussion of funding & reauthorization of such efforts forces recognition of problems in the system; even if overall contribution of such efforts to the health status is not firmly documented. Suggests that we 'go back & forth'; not sure of the correct way forward but that researchers & advocates interested in service provision to the underserved need to wrestle with these questions.	We need to understand the political system in which we work and what strategies work in what given circumstances. Need to be very cognizant of the policies being made /recommended and how they are expected and will drive change in our health care system. This paper focused on policy itself; no discussion on Telehealth but the understanding can be adapted to the work with Telehealth.

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Policy Recommendations	Applicability to Alberta
Debatable if proposed rule represents an improvement over previous process of allocation & did not decrease the data burden as projected. Noted inclusions of other measures of health care needs (variables listed) and resultant changes in designations may indicate better targeting of federal assistance.	Not directly applicable to Alberta but indirectly indicates the importance of being able to replicate tests to achieve the same results. If policy is being set by a new methodology, need to be able to pre-determine predictable results as much as possible but be alert to different outcomes than expected & to be prepared to discuss proposed policy & change, if necessary to prevent undue burden where it was not intended.

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Policy Recommendations	Applicability to Alberta
Leadership is required to establish a shared vision & way forward. Appropriate financing methodology (public or private) needs to be found. If IT/TC changes the way HCPs work, then large numbers of HCPs will need to improve their IT/TC skills & this will impact older practitioners. Suggest that priority areas cited in their policy document (1998) are issues in themselves i.e., -Infrastructure; -Training; -Standards development; -Legal & regulatory frameworks & -Raising awareness of the potential of IT/TC.	Social situations and use of IT & TC in Australia & Canada appear to be similar with similar issues arising. As part of & in addition to the Mazankowski Report, it may be wise for Alberta to re-examine its policies & government structures in setting direction for IT/TC in Health that will most effectively address the social needs & use of these technologies to best impact health & social outcomes. Priority areas/issues identified in AU are similar as well to Canada/AB. While each are being addressed, the need to raise awareness of TM among HCPs, educators & the public is very evident as minimal effort has been evident in the marketing of services available. We must be prepared to recognize & address both the positive & negative social & economic impacts of TM on rural and urban communities as well as on individuals and to weigh them carefully. This requires collaboration between users & providers.

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Policy Recommendations	Applicability to Alberta

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Policy Recommendations	Applicability to Alberta
Need to determine why early programs were not sustained & learn from them. Evaluation research is crucial to determine the value of TM (especially in rural areas) & its effects on health care delivery, benefits to consumers & communities by observing how it affects the behavior of consumers e.g., in where & how they seek care. To do so, it requires a well-designed analytical framework capable of modeling changes in behavior & that can identify potential direct & in-direct benefits & costs in relation, at minimum to access, quality & cost. Also requires cooperation of parties affected e.g., HCPs, patients, hospital & program administrat-ors, & policymakers. Suggest the relevant policy question to be: "What combination of services & delivery is most efficient, & how does that change as the demographic & geographic parameters change?" p.12.	Continue to find ways to determine the best combination of services & delivery mechanisms that are most efficient & between what communities Education & administration are the current 2 greatest uses of the TH v/c system with minimal growth in clinical services. We need to seek more ways of determining if these are the greatest needs? If so, is the delivery service efficient? How can it be improved? What are the needed clinical services; where is the need? Who can best deliver them? What policy decisions are needed, and by whom, to move the service forward? Apply & build on this information to strengthen the design of future research studies. We do engage various stakeholders in decision-making but perhaps need greater consumer involvement in making decisions & setting policy.

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Policy Recommendations	Applicability to Alberta
Recommend 'benefit-cost analysis' (BCA) as a framework for analysis of TM and to consider the effects of disparate distribution of costs & benefits between different parties e.g., patients, physicians, other HCPs & tax payers.	

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APPENDIX P: CRITIQUE POLICY

Policy Recommendations	Applicability to Alberta
State the need to continue to conduct policy-relevant research & careful evaluation of the changing nature of health care delivery in rural areas to assist HCFA and others in developing new approaches to support rural communities and providers in the delivery of high-quality, CE service to Medicare and Medicaid beneficiaries & other rural residents. Also state that although TM has the potential to enhance access to services for rural/remote commun-ities, that fundamental issues need to be addressed through more research e.g., -Efficacy; -Costs; -CE; -Outcomes; -Standards of Practice -Utilization; -Practice Guidelines & -Payment	Reflects that outcomes may be quite different from predicted and, therefore, points to the need to be careful in making & implementing policy decisions; that decisions made with good intent may, or may not be, the right ones. Also reinforces the need to evaluate decisions in a timely manner. Provides a base to draw socio-economic indicators from that may be of value in contributing to strengthening future research or necessary decisions. Shows the importance of context to the decision-making process.

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Policy Recommendations	Applicability to Alberta

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APPENDIX P: CRITIQUE POLICY

Policy Recommendations	Applicability to Alberta
Emphasize the need for TC equipment to interface, in some manner, with the extended social structure. Suggest the obvious applications for this population would be: -Easy access to instructional programs, consultative services, & informational data banks; -Facilitation of collaborative efforts & completion of feedback following referral; -Assistance in increasing public awareness [regarding the nature of mental illness in the elderly mentally retarded population]; -Assessment of individuals response to treatment; -Have conference networks for ongoing interaction between family members in isolated areas and urban professionals regularly & -Assisting in teaching &/or re-teaching of new behaviors.	Perhaps Alberta needs to re-think our application strategy & determine our philosophical approach to implementation & utilization of TH services. There may be a better way to use the philosophical approach in determining the needs/uses for TH & in marketing it.

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Policy Recommendations	**Applicability to Alberta**
To conduct RCT's to validate outcomes and to determine cost effectiveness and cost utility.	Place more emphasis on Telehealth for tele-homecare applications than what we have to date. Reinforces the need to assess what type of technology is most appropriate for the problem/clinical need being addressed. Lifestyles may be enhanced through the use of Telehealth services for chronic illness or CDM by empowering consumers; decreasing travel; increasing access to services; potentially decreasing costs to the individual; ? to the clinicians/system.

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APPENDIX P: CRITIQUE POLICY

Policy Recommendations	Applicability to Alberta
Research on cost & quality of care important to payers & policymakers to determine place of rehab psychology in future technology-laden iterations of the health care system. Important for large scale evaluations on differential effects of TMHS to become a funding priority of federal health care agencies; recommend RCT's in CDM. Conduct CE studies; TH must show that costs of tx are at least equal to or less than alternative approaches to produce similar outcomes. Essential to understand the social-psychological mechanisms that link intervention & outcome.	

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Policy Recommendations	Applicability to Alberta
None	Interesting approach. Promotes the need for people who use TH technology to take the lead in applying it in new ways e.g., to conduct and produce such work through the technology rather than having typical face-to-face meetings. It is certainly being used to do so but reminds us of new uses.

APPENDIX P: CRITIQUE POLICY

Policy Recommendations	Applicability to Alberta
In addition to CE and efficiencies, evaluate Telehomecare in light of justice criteria, its effect on patient quality of life and its impact on provider: patient relationships.	The moral issues of the home care setting are important considerations in evaluating the socio-economic indicators of TH. Ethics takes into account the context in which the care is delivered and will help link the technology to the patient/family.
Suggests it may be necessary to determine a morally justifiable trade-off between improved availability and access and less satisfactory provider:patient relationships e.g., could less satisfactory & morally optimal provider:patient relationships be justified if patient access to health care increased & large sums of money were saved?	Not aware of specific work in Alberta on ethical issues in relation to TH.

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APPENDIX P: CRITIQUE POLICY

Policy Recommendations	Applicability to Alberta
1.Develop a national policy on telecare, based on a *coherent framework* formulated through participation of multiple care agencies e.g., public & private care providers, housing, insurance companies & users. 2.Make a *prudent choice of technologies* with a view of ensuring that telecare is implemented realistically & successfully. 3.Understand issues of *user acceptance* through detailed long-term trials in demonstration projects. Government initiative & leadership must ensure a consistent approach across departments to help obtain acceptance. Benefits of telecare merit close consideration; especially in respect to long-term savings & efficiency in provision of care.	Telehomecare is in early stages in AB but needs more attention paid to it for a number of reasons e.g., -Potential way to assist people stay in their homes & to be more independent; -Assist in giving people more control over their lives; -Potential to improve quality while reducing costs to the system; & -Potential to improve efficiency for HCP's providing care in the home. Look at collaboration among a cross section of service providers e.g., housing, insurance companies in proceeding with planning & implementation. Recognize that strong evidence for socio-economic impacts can not be obtained in short time frames. Formulate and communicate national/provincial policy statements & evaluation findings on telecare [Telehealth] more publicly than is currently being done to inform potential consumers of more choices for health care.

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APPENDIX P: CRITIQUE POLICY

Policy Recommendations	Applicability to Alberta
Recommend future research: -technical development of integrated systems; -effects of technical options for telecare on users & their carers; -industrial exploitation & market opportunities for telecare technologies & services, through a detailed examination of different systems to identify which could have the highest appeal as an off-the-shelf system; & which potential care providers can pick and mix component parts to meet specific needs; and -robust methods for evaluation telecare projects with the aim of developing indicators for impact assessment of telecare on care provision. Social & economic research on the effects of telecare requires a longer time span, unlike technology research, to produce sound evidence. Policy makers collaborate to develop an evaluation methodology applicable to a series of pilots to identify social, economic benefits.	Need a policy statement (with incentives & attached dollars) from the national &provincial governments that directs the development of telehomecare [Telehealth] in the country/province. Use this document to elicit further details when planning a telecare project.

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Policy Recommendations	Applicability to Alberta
Use approach identified as an abstract tool for the development of specific secure health care environments. This data protection scheme combines CE & customized RM measures but deploy-ment depends upon the organization's management support & on the cooperation between the stakeholders of the offered healthcare service.	Being aware of this work as a resource tool to assess risk for new applications.

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Policy Recommendations	Applicability to Alberta
Type of device depends upon the assessed client need. Suitable measures must be taken at the design stage to build in resilience to individual failures so that systems will be fail safe and degrade graceful. The system must be made aware of any failures; best way to achieve this is to build in techniques of allowing the system to monitor its own 'health'.	Adds awareness of the need to conduct risk assessments as part of implementing new telecare applications. Is a resource to provide information risk assessment.

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APPENDIX P: CRITIQUE POLICY

Policy Recommendations	Applicability to Alberta
Despite rapid design, innovation and sleek, user-friendly devices, the redefining of health care delivery should still contain a significant application of compassion and caring.	Remember the people that are involved and the personal needs when introducing technology (low or high).

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APPENDIX P: CRITIQUE POLICY

Policy Recommendations	Applicability to Alberta
Development can only accelerate if major public policy issues created by the TC revolution are dealt with. Challenge ahead is to sustain the growth, quality & equity of care. To do so, need to address legal, economic & technol-ogical issues e.g., Who is going to pay? Cite the most central key issue affecting TM's future to be the role the Internet will play in its development and how to determine if it is accurate, reliable & private. The question of Information Fraud needs to be addressed to determine if it is any worse on the Internet than that found in the real world. Suggest that TC & the Internet will continue to change how health information is transmitted & received & how people and organizations will interact in the delivery of care as patients assume a more active role & the point of care will become increasingly closer to the patient.	Alberta is in the process of determining how to sustain the TH program. Asynchronous modes of information exchange as well as how to better integrate data transfer are being addressed but are yet to be determined. Policy could drive integration. The current federal Electronic Health Record initiative could facilitate this integration but, currently, it has not included Telehealth in its mandate.

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Policy Recommendations	Applicability to Alberta
Predicts that environ-mental health may be one of the new important future uses with smart devices to collect data about the patients' environment e.g., humidity, temperature, carbon monoxide levels that can be analyzed to assess one's state of health & identify external factors that may influence it.	

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Policy Recommendations	Applicability to Alberta
To introduce home telecare for routine use, specific monitoring units, employing physicians & technicians with appropriate training, should be set up. To convert home telecare from research to operational practice, a proportion of the budget of national health service needs to be specifically directed to it. State the most important aspects of telehome care are: -Organization & training; -Improving quality of care; -Improving quality of life; -Economy; -Properly assessed technology.	It is important for Alberta to re-assess the needs/ opportunities for tele-homecare; especially in relation to rural & vulnerable populations. This service may be being provided by the Capital Health Link & the upcoming Calgary Health Region Contact Programs. If not, perhaps the question should be asked if there is potential to integrate the monitoring services in those programs.

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APPENDIX P: CRITIQUE POLICY

Policy Recommendations	**Applicability to Alberta**

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Policy Recommendations	Applicability to Alberta
Cite need for large scale trials to compare quality of life & health outcomes of a matched cohort of elderly subjects (some supported with tele-homecare & others with conventional care, to provide evidence that home telecare leads to a clear diminution of acute care episodes, improved quality of life & reduced age related morbidity at reduced costs.	Reinforces the need for further trials of home telecare in AB to look at need, quality & cost.

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APPENDIX P: CRITIQUE POLICY

Policy Recommendations	Applicability to Alberta
Recommendations (p.13): "-Set realistic G&O's; include nurses in the planning process; -Assess patient attit-udes toward computers before beginning the project; periodically during; & at completion; -Assess the home environment for electricity, lighting, space & safety; -Review benefits & risks with patient, obtain written consent, provide a copy to patient; -Provide training & opportunities for patients to gain experience & confid-ence with the equip-ment before beginning video visits -Leave instructions, with diagrams, in the home in large font & language at 5th grade; -Provide technical support, either on-line or in person during working hours with back-up for on-call & weekend nurses; -Provide feedback to patients regarding improvements in health status; clinical measures, etc." Need further research on content of video visits & an analysis of patterns of use to determine the types of patients & nurses best suited to telehomecare & on impact of medical peripherals.	Provides specific steps for tele-homecare assessment, implementation & evaluation research.

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Policy Recommendations	Applicability to Alberta
None	Need to carefully consider greater use of telehomecare in AB given the capability of reasonably low cost, simple equipment to deliver services across the continuum of care that will better support people who are released early from an acute event in hospital, to assist with recovery and/or support those with chronic needs. It appears to be very viable.

APPENDIX P: CRITIQUE POLICY

Policy Recommendations	Applicability to Alberta
None cited but infers definite interest in using telephone triage (telecare) and tele-homecare programs to increase access to services and to reduce cost of providing enhanced service.	Implementation of The Capital Health LINKS project in Edmonton and the upcoming CONTACT project in the Calgary Health Region appear to be extensions of the telephone advice programs using diagnostic algorithm software initiated in Moncton, NB and grew through NS, Quebec & Ontario. Each program appears to be using the core teletriage concept and adapting it to fit individual needs and new ideas.

APPENDIX P: CRITIQUE POLICY

Policy Recommendations	Applicability to Alberta

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Policy Recommendations	Applicability to Alberta
Suggest TM champions must obtain evidence that optimum use is feasible within current organizational structures and that the ultimate test of TM will be to show positive effect on patient outcomes. State that pilot studies can provide valuable information useful to optimize utilization & modify the technology to meet the needs of the users but that further study is required to explore the factors that contribute to organizational readiness for success-ful implementation of TM.	Commitment of administrations to TH has varied throughout Alberta. One health authority regularly attributes its success to their senior management support. It would be interesting to conduct a study looking at this variable in relation to the level of success of TH. Again reflects that policies can have either a positive or negative effect on implementation &/or success of a project/ program.

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APPENDIX P: CRITIQUE POLICY

Policy Recommendations	Applicability to Alberta
State the need to maximize the acceptability & usability of telecare technologies & to give more consideration to people who are the beneficiaries of telecare to increase the potential of meeting the objective for independent living. Telecare technologies must 'fit in' with other developments & embrace good dwelling design & 'smart' house technologies. A clear ethical framework for tele homecare applications needs to be developed.	Another study that suggests the use of TH [telehomecare] must be linked to philosophical under-pinnings & integrated with daily living to increase usability & acceptability. Unaware of any work in Alberta relating ethics to Telehealth Need to determine if Alberta has developed any ethical frameworks in relation to Telehealth &, if so, who has issued them & hat they address.

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APPENDIX P: CRITIQUE POLICY

Policy Recommendations	Applicability to Alberta
Quality, legal & ethical issues will need to be addressed and a reliable system of payment would be required to offer such services e.g., need to recognize legal differences regarding specific services between countries e.g., abortion.	There are endless possibilities for TH in Alberta/Canada. We need to think futuristically but to also be prudent in our choices. We have been, and should continue to be, leaders in TH so futuristic thinking provides opportunity to select where & how improved care can be provided for Albertans, improvements for the provider and system can be realized while at the same time think more globally in our applications rather than get locked-in by the obstacles.
State that if developments in integrated home systems are going to realized full potential for rehabilitation, discussion is needed in development stages of applications & products & in setting policy for HA's & Social Services; to include: -Potential users; -HCPs (clinicians & therapists); -Technologists & -Administrators.	Consultation is generally practiced in Alberta in creating new applications but often does not involve consumers of the service. It is interesting to note the that 'potential users' are included, and are first in the listing.

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APPENDIX P: CRITIQUE POLICY

Policy Recommendations	Applicability to Alberta
Insurance reimbursement for TM must be put in place if use is going to increase.	Resolving the reimbursement issue has been initiated in Alberta but remains unsatisfactory to some physicians & service coverage is limited.

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APPENDIX P: CRITIQUE POLICY

Policy Recommendations	**Applicability to Alberta**
If potential of TH to reduce inequalities & improve access to services, then levels of use will need to substantially increase. Needs of special populations such as Aboriginals, Torres Strait Islanders &, especially, migrants from non-English speaking backgrounds should not be overlooked.	Consistent with evolution & utilization of the Alberta program; similar findings in the AMHB evaluation. Levels of use have to increase to improve access, reduce inequalities to service and to determine the economic & social outcomes of MH [TH] programs. Cultural needs are being addressed.

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APPENDIX P: CRITIQUE POLICY

Policy Recommendations	Applicability to Alberta
Case for a closer connection between the conduct of tele-radiology evaluation studies and the incorporation of the results into health policy. This link would ensure that the benefits of the technology are made available to the public as soon as possible. Factors needing to be overcome include: -Modification of over-seas equipment & software; -National health policies involving state & federal responsibilities; -Need to obtain support & cooperation from clinicians & hospital administrators; -Relative funding priorities & -Government policies. Need a shorter time frame between availability of tech-nology & widespread implementation in improving patient management & outcome.	Health policy for teleradiology, to date, has been developed collaboratively with the Alberta College of Physicians & Surgeons & AB Association of Radiologists to ensure decisions are acceptable to all groups. It has influenced change in the interpretation of the requirement for a radiologist 'to be on site' for CT Scanning to being available through TC. Similarities exist between AU & CA in that tekeradiology is both private & publicly funded. Further evaluation is required to determine the differences/CE in the 2 systems & if it is appropriate to offer the service in both or if there are differences that should be recognized.

APPENDIX P: CRITIQUE POLICY

Policy Recommendations	Applicability to Alberta
It is important to understand that TM is not a substitute for face-to-face medical practice but rather that it is a tool to complement current health care.	While benefits are perceived, limited usage continues to raise the question of cost effectiveness. Teleradiology appears to remain a threat to Radiologists; more experience & high quality research on usage and CE is required to determine how best and where to use this service most efficiently.

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APPENDIX P: CRITIQUE POLICY

Policy Recommendations	Applicability to Alberta
Essential that Canadian health care decision makers abandon parochial mind sets & take every opportunity to share resources across regions, to integrate existing systems & institutions, and to ensure that this new mentality permeates all aspects of the development & pro-curement of future technology & the formation or reorganization of institutions.	Continue to look for opportunities to create policy that will cross regions & lead to integration of new technologies within existing systems. Continue to raise awareness of TH to change attitudes toward its use.
Important to remove all unnecessary delays & requirements to make the CA medical imaging community more competitive globally & facilitate diffusion of beneficial technology throughout the HC system. Equally important for the regulatory framework to stay abreast of rapid changes or to anticipate them.	Reinforces need to collaborate between industry & HCPs and/or related resources and to included health regulatory bodies in decisions in order to expedite regulatory changes to expedite system changes to move TH forward.
Acknowledge & meet the ethical & legal challenges for the Canadian HC system to reap the full benefits promised for dynamic field of medical imaging e.g., leaders devis a governance framework for TH to ensure compliance with existing legislation & to permit HCPs understand & fulfill their responsibilities.	Ethical & legal issues have been identified & work is in progress to address them. Continue to be conscientious with technical security to maintain privacy of image/data transfer. Continue work to address legal issues but do so more quickly e.g., consent policy that is a national issue; is currently being addressed for Alberta through Alberta Wellnet.

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APPENDIX P: CRITIQUE POLICY

Policy Recommendations	Applicability to Alberta
To achieve moral obligations, recommend: -Clear contracts between user & provider of TR advice, specifying minimum standards of training, possibly to include international recognized system for accreditation; to include language skills, medical qualification, interpretation of radiological images & notes; -Clear contractual undertaking by both parties regarding liability, insurance & negligence; -Appropriate TQM standards, regularly reviewed & imple-mented with inclusion of both user & provider. -Clear & binding financial arrangements between parties; -Commitment by all parties to the highest international standards of data protection & patient confidentiality; -Contractual oblig-ations on the information service provider to agreed standards of reliability & security of data transfer subject to approval by Medical Devices Agency;	Most of these factors have been, or are under, consideration. It is a concise resource to use in developing research projects and/or in establishing policy to assist covering the varying perspectives/ needs. Recognize these areas to consider but not to become overwhelmed by these ethical considerations & prevent TM moving forward. Consider what is needed in specific situations as this paper is written from an international perspective of use.

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Policy Recommendations	Applicability to Alberta
-Commitment by the professions to regular technology assessment, including economic evaluation; -Establish regular teleconferencing to replace clinicorad-iological meetings; & -Debate within the profession, with public participation, about the impact of TM technology on professional standards, values, quality of work & experience of work.	

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Policy Recommendations	Applicability to Alberta
Need for quality outcome studies regarding clinical effectiveness & CE. Need for guidelines for planning and implementation, user training, and program sustainability. Need to address medico-legal issues within provinces & nationally where applicable. HC in Canada is delivered through a patchwork of provincial regulations & no TH system will bridge all the regional differences that exist. However, cited one paper of Watanabe, Jennett & Watson to state: "…uncertainties about the impact of TH represent a 'Catch 22' situation. Some governments & associations are reluctant to embrace TH practices on a wider scale. Yet, unless TH is practiced in real-life settings on a broader scale, many outstanding issues will remain unsolved."	Reinforces need for quality scientific research on clinical & cost effectiveness. Shows continued minimal use despite widespread implementation. We need to determine why and what is needed to increase use in order to be able to evaluate it – as the 'Catch 22' issue states. Reinforces need to address medico-legal issues as previously addressed.

APPENDIX P: CRITIQUE POLICY

Policy Recommendations	Applicability to Alberta
Funding for TD found to be greatest issue; suggest depends on political will of the Ministry of Health & district health boards.Need to pay both PCP & hospital for a TM consult. There needs to be a proper analysis of the potential costs & economic gains of setting up multi-specialty TM consults Need for all stakeholders to be involved in planning new services and for equipment to be portable, flexible & fully integrated e.g., HER & broadband network.Important to recognize & use principles of marketing in implementation as found concerns about ability to diagnose & manage patients by TM is less of an issue than implementation.	Recognized that people issues are greater than TC & technology issues & the, subsequent, need to involve key stakeholders in the decision-making processes. Alberta is experiencing the resistance to clinical applications but is seeing an increase use of v/c for educational administrative services. We need to look carefully at costs, funding, and the balance of benefits to burdens; what 'price' is worth paying for TH service.

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Policy Recommendations	Applicability to Alberta

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APPENDIX P: CRITIQUE POLICY

Policy Recommendations	Applicability to Alberta
Questions if TM will become a popular mode of health intervention given the current political, economic & ideological climate in which it operates. Suggests answers to a number of questions will have implications for design, imple-mentation & evaluation of TM/TH programs & for its expansion globally. Questions focus on: -Social processes inherent in development & adoption of cyber-technologies; -Effects of technologies on people, power structures & community; -Rituals, practices & values engendered by the use of TM.	Raises issues about social effects of TM that are seldom addressed in the literature and how the changes in care delivery may impact other structures –positively and/ or negatively. These perhaps should be given greater consideration in adopting new practices.

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APPENDIX P: CRITIQUE POLICY

Policy Recommendations	Applicability to Alberta
Virtual reality requires redefining of the idea of what constitutes a complete medical education e.g., perfecting manual skills and treating rare disorders on simulators. A robust model of the human body is needed for more advanced tasks e.g., planning of surgery. Acceptance of simulators & trainers depends heavily on the realism of the virtual human body models on which they are based i.e., be multidimensional, specific, temporal and able to accurately predict outcomes of surgery & the healing process over time.	We are aware of telepresence being used in Canada. Edmonton has one of the first patient simulators in Canada. We need to keep abreast of work in this field and be willing to move forward with it but, at the same time, to prepared to assess it carefully against the criteria being put forward for other TM programs e.g., risk, medico-legal implications & CE.

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Policy Recommendations	Applicability to Alberta
Use of VEs in TM is linked more to organizational changes in the structure of the relevant health service than to technology. Therefore, to spread this process, further research is needed. Important for professionals in this field to share information about their experience & to examine the results of evaluations to speed up suitable development work.	Makes us think futuristically. Need to anticipate what the needs may be and to ensure that high quality research is conducted prior to widespread implementation. CE must also be well considered.

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APPENDIX P: CRITIQUE POLICY

Policy Recommendations	Applicability to Alberta
Suggest integration of ERH with TH import-ant in order to be able to transfer information necessary to make the dx. Also recommend clinical & technical protocols need to be well established. Diabetic Retinopathy appears to be successfully dx via TM. State critical issues facing TM now are: -Licensing/credential-ing; -Legal liability; -Reimbursement; -Regulatory & political hurdles to overcome; -Acceptance by practitioners & patients; -Cost efficiency/CE; -Overcome cultural & geographical barriers; -Sustainability of programs.	

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Policy Recommendations	Applicability to Alberta
Policy changes, business strategies and the innovative use of new & emerging technologies can remove many of the current barriers to use. Australian govern-ment & industry should continue to work together to ensure that research & development lead to the rapid commercialization of e-health technologies. Need for industry to work with health customers to overcome distrust & to explain the new business models for e-health. The perception of TM as an 'add-on' needs to change to improve its CE. TH is more likely to be CE & sustained if it is seen as part of a larger domain i.e., e-health.	Alberta is progressing through many of these barriers and, in fact are leading in some areas e.g., development of Technical Standards between Alberta Wellnet & Alberta Research Council with input to ISO; working with vendors to refine standards & remuneration systems in progress but further policy changes and innovations are needed to further contribute to TH being successful e.g., -Improved remuneration system; -Changes to Import/ Export funding formula; -Formalization of an improved process for policy development & enforcement -Continued increased awareness of TH among HCPs, educators & consumers to better integrate TH into the health care system and, thereby, work toward changing the perspective of it being an 'add-on' service.

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APPENDIX P: CRITIQUE POLICY

Policy Recommendations	**Applicability to Alberta**
Must recognize and deal with the technical, organizational & societal aspects of TM to prevent failure & contribute to the wider, successful implementation of TM systems in the future. Suggest that recognizing the *people* aspect is vital and the importance of making the use of technical systems as close as possible to what people do in real life to make them acceptable and to minimize training.	The issues identified are similar to those already known and being worked on in Alberta. Need to continue to pay closer attention to the need(s) for TM and to implement the technology accordingly. Reinforces the need for the technology to be related to a need that *people/society* have identified.

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Policy Recommendations	Applicability to Alberta
Conclude that TH is oscillating between 2 extremes i.e., too far ahead to stop or being stopped at the end of pilots without sustainable funding. Because of this, suggest the policy making process could remain at a standstill until a clearer under-standing emerges of the clinical & geographical circum-stances in which it proves beneficial. Recommend that integrated research on the 4 mechanisms would help to situate the value of TH within the broader perspective of the health care system & prioritize dissemin-ation of the most needed applications. Research also needed on legal issues, reimbursement &funding.	This framework could be helpful in making decisions regarding new TH applications. Points out the 'catch 22' policy makers are caught in i.e., to continue to support and move TH forward or to stop TH until more evidence is obtained. It indicates the importance of policy makers having to weigh the evidence available with what is not available and make the best decisions possible to promote or halt THs' role in our health care system.
Looking to the future of computer-aided navigation & robotic assistance, based on same surgical data sets, to be available in all fields of surgery. State it is the task of our generation to preserve the traditional qualities of surgery while keeping an open mind to the benefits of a society-revolutionizing technology.	We see this type of surgery starting to occur in reality and, as they suggest, it is important for us to "to keep an open mind to the benefits of society revolutionizing technology" but to balance this with what is important to society as a whole. It will require choice in allocation of resources and in looking at both the short and long term policy decisions.

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Policy Recommendations	Applicability to Alberta
Benefits & risks of each system will need careful evaluation.	See above comments.

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APPENDIX P: CRITIQUE POLICY

Policy Recommendations	Applicability to Alberta
Need to address several complex legal & regulatory issues before widespread TP can occur e.g.: -Quality -Confidentiality -Licensing -Evaluation -Practice Standards -Reimbursement -Patient & Provider acceptance -Costs-Equipment standards & compatibility -Malpractice. Also need to develop regulatory framework to address such issues as fair pricing & equal access to TC services.	Telepathology has been discussed for use in Alberta but no programs are known to be active at this time. While decisive action on a number of the complex legal and regulatory issues are recognized & are being addressed, the comment about more concern than decisive action does apply to AB. Writing this report is one approach to stimulating more decisions in these areas.

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Policy Recommendations	Applicability to Alberta
Need studies on -Effectiveness, -Cost, & -Societal implications of TM. Need to resolve: -Practice models & standards, -Training programs; -Regulations; -Licensing, -Legal questions.	The main pharmacy application known to be in progress in Alberta is the Internet-based Pharmacy Information Network (PIN) through Alberta Wellnet. There are tremendous opportunities & challenges for pharmacists, medical doctors, other HCPs, consumers & to the health care system as a whole in making such a significant change in processes. It will need to be evaluated in the same manner as other applications to determine its costs & benefits to the HCPs, consumers & system.

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APPENDIX P: CRITIQUE POLICY

Policy Recommendations	Applicability to Alberta
Must resolve the organizational, legal, financial & special interest issues to further realize the benefits of TH. Suggest that the term TM will become obsolete by the end of the next century 'because what we now see as bold & new will be woven so completely into the fabric of medical practice that it will neither require nor occasion the need for a special term to define it.' (p.156)	We must resolve the barriers that are repeatedly recognized as impediments to moving Telehealth forward. Work is various stages but it appears that greater attention needs to be paid to these issues to eliminate them as 'barriers'.

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APPENDIX P: CRITIQUE POLICY

Policy Recommendations	Applicability to Alberta
Must strike a balance in the use of TM. The recommended starting points are a consumer and society based, fully integrated framework for TM analysis & investment and international strategies to protect citizens from malevolent abuse. Identified 4 principles with 5 related effects to underpin TM development & the local policies for its exploitation i.e., 1.Ethical Principle (equity in health care) 2.Measurement (case-based information) 3.Communication (Telematic system) &4.Action (Resource management & quality of care). Advocates routine use of risk analysis of TM applications at research & policy levels. Identifies need for an effects-oriented analytic framework & for international policy collaboration to protect users of services available by global TC.	Good resource document for an effects-oriented framework and risk analysis framework. Reminds us of the need to look at the cons of TM and to consider them carefully to build in preventive measures where possible to protect society & HCs from harm in using TM.

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APPENDIX P: CRITIQUE POLICY

Policy Recommendations	Applicability to Alberta
Need to use information more intelligently & reduce costs e.g., decrease duplication of medical records & repeating dx tests, prescribe multiple drugs i.e., to collect information more systematically & have it more readily available to institutions, HCPs & policy makers.	Albertans and Canadians do have the opportunity to become world leaders in adapting the new ICTs to improve health systems as the conclusion to this conference suggests. While work is progressing, AB could be further ahead if policies were put in place to reduce the persistently identified barriers and that would actively promote the use of TH to increase access to health services in a more timely way & decrease duplication of resources as well as travel.
Need to be successful in merging hc system with new infrastructure to be world leaders in TH; creating jobs & main-taining benefits of hc system.	
To take initiatives to the next level will require 2 broad thrusts: 1."Development of policy frameworks by provincial & federal governments in ways that will accelerate the development of TH systems in CA & 2.Commercialize the expertise developed in these projects to viable products and services for CA & foreign markets", p. 8 Example of effect of such thrusts is to eliminate policies that prevent billing for teleconsultations.	We need to know about the reports that have been developed and use them to identify strategies &assist in influencing key players that can influence and/or make these needed policies.

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Policy Recommendations	Applicability to Alberta
Implement at a measured pace to 'get it right' i.e., by applying technology to a need to improve quality of care. Recognize importance of FTC encounters. Important to continue to share experiences & lessons learned with TH & TC, innovating & deploy-ing new systems & aggressively address complex legal, social & policy issues.	

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Policy Recommendations	Applicability to Alberta
Sensitivity Analysis needed on management accounting methods used to define equipment costs & to project CE based on variation in demand. Essential to evaluate programs after they have achieved a steady state of operation & full fidelity. One most critical issue to both professional acceptance and wide dissemination of TM is CE. Must demonstrate cost-containment potential to policy makers, the medical profession, and general public to achieve 'massive conversions' to TM; ones that would surpass the HMO movement. For TM users to establish professional credibility & police themselves need: -Established norms of professional conduct -Standards for quality performance & -Guidelines for clinical practice that include: -Triage system -Code of ethics	Excellent resource paper packed full of varying positions, observations & suggestions. Very practical and useful reference information when developing, evaluating, monitoring TM programs. Practical approaches and suggestions regarding research methodologies with explanations why so few methodologies used to date are not providing evidence being sought. Encouraging by referring to other practices that are now commonplace but reminds us how difficult they were to be accepted e.g., hand washing to prevent disease.

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Policy Recommendations	Applicability to Alberta
-Practice guidelines -Quality assurance mechanisms unique to TM -Outcome based criteria & standards to assess quality & monitor progress -Recruitment, training & certification of qualified staff to perform various clinical, admin & fiscal functions of operating a TM system. TM will 'come of age' when its competitive potential is realized in the market & when TM systems exploit the full potential of technology to develop efficient integrated networks to serve the needs of local communities, regions, nation & globe.	

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Policy Recommendations	Applicability to Alberta
Study suggests TM may be an avenue for the delivery of orthopaedic care to patients residing in areas where orthopedic specialists are not available. Recommend physicians practicing TM across state lines be licensed in the state where the patient is being examined until a national policy about licensure is put in place. Future studies need to be done to evaluate additional outcome data and to examine cost benefit factors to deliver orthopedic care via TM.	Benefits of the service and barriers to it are similar to other studies and must be resolved for TH to move forward in AB, nationally and internationally.

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APPENDIX P: CRITIQUE POLICY

Policy Recommendations	Applicability to Alberta
TM must prove its worth in the marketplace. Necessary to conduct studies of medical accuracy & CE to get third party payers to reimburse services via TM. Predict TM and TP will become commonplace in the near future.	As above re TP

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Policy Recommendations	Applicability to Alberta
Possible for HMO's to develop TM networks as TM consultation may be very compatible with a managed care orientation resulting in extending managed care into rural areas & possibly consolidating HMO provider resources in urban areas. Expect to see TM serve nursing home residents & homecare. Investigation needed to determine effectiveness, effects on costs and access to medical care. Research ought to be directed toward a thorough anticipation and understanding of expected changes to the health care delivery system via TM over the next 2 to 3 decades.	The first decade has almost passed since this paper was written and yet it describes concerns and issues regarding TM to be similar to current issues. Policy decisions must be made that will resolve these issues before the next decade's articles are written/read!

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APPENDIX P: CRITIQUE POLICY

Policy Recommendations	Applicability to Alberta
Suggest the need for RCTs to test TM projects with the same rigor as other inter-ventions in medical care but recognize the problems associated with doing so are not well understood. Suggest developing a centre for excellence in TM to have an organized academic body to represent people interested in TM. Need a formal training program for TM.	Identified needs early in the use of TM that are currently being addressed; evidence again that the technology is moving faster than the policy organizational and other user decisions/ activities.

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Policy Recommendations	Applicability to Alberta
All personnel involved in TM require training i.e., clinical & non-clinical staff. Must address logistical & procedural issues & medical aspects of service. Communication skills are required in both technical & inter-personal aspects of using advanced TC equipment. Retrospective review & prospective research to: -Improve the effectiveness of service delivery; -Efficiency of use of available resources; -Equity of access to services. Health service purchasers & providers must base decisions upon proven benefits; not beliefs. The place of appropriate technology within TM is fundamental to provision of such a technology-based service. Suggest the application of these principles having been applied in most challenging locations shows their strength & that they can now be used as a model in providing TM for the general public.	Principles identified are generally used in TH applications in AB. Reinforces the need for training – a need that is often minimized in the implementation process and should be given higher priority & resource allocation to ensure it is completed adequately. Communication skills are known to be important in all inter-actions & are being considered as a need to be addressed in applying TH. Further supports the need for ongoing scientific research in TH services.

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APPENDIX Q: CRITIQUE QUALITATIVE

Author/ Article Title/ Year/ Country	Purpose/ Objectives	Design/Data Collection	Analysis	Participants: age/ gender/ groups	Outcomes/ Socio-Economic Indicators
Campbell JD, Harris KD, Hodge R. introducing telemedicine technology to rural physicians and settings. Journal of Family Practice 2001; 50(5):419-424. **USA**	To investigate rural health providers' perceptions of telemedicine, to develop a framework for assessing their readiness to adopt this type of technology, and to offer a guide for its implementation.	Data from qualitative semi-structured interviews was collected. Authors measured how often health providers used telemedicine technology and their perceptions of the advantages, disadvantages, barriers and facilitators involved in adopting it.	Data was transcribed verbatim and entered into a computer database program, Ethnograph, which was designed to help organize textual material. Interviews were divided by technology type (videoconferencing versus the computer component), and made initial template analysis to organize and code the data. The investigators further readings of the interviews led to further revisions of the codes until consensus was reached on the identification of salient issues or themes.	Data was gathered at 10 outpatient clinics. N=57 interviews completed. N=13 physicians n=20 nurses or nurse practitioners n=24 administrative staff.	Those practices that were affiliated with a public tertiary care center had higher telemedicine use than those in private practices, although the overall use level would be considered low. Health care practices are enmeshed in networks of social relationships. Although some participants affiliated with the tertiary center saw the technology as a "good thing", others, particularly those in private practice, saw it as a potential threat to their sense of competency, autonomy and livelihood. Some physicians interviewed saw no compelling reason to integrate telemedicine into their practices. When it comes to adopting new technology, some participants were philosophical about what they described as a human aversion to change. Some providers had little confidence in their ability to operate the technology, and one nurse feared that her ignorance would lead to legal trouble.

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Author/ Article Title/ Year/ Country	Purpose/ Objectives	Design/Data Collection	Analysis	Participants: age/ gender/ groups	Outcomes/ Socio-Economic Indicators
Carroll DL, Robinson E, Buselli E, Berry D, Rankin SH. Activities of the APN to enhance unpartnered elders self-efficacy after myocardial infarction. Clinical Nurse Specialist 2001; 15(2):60-66. **USA**	The purpose of the article is to describe the activities of an APN in a nurse-coached intervention study for unpartnered elders post-myocardial infarction.	Data consisted of free-text comments written by the APN on the Nursing Intervention Telephone Data Form. These forms created a log for the 44 subjects who were in the APN-coached intervention. During each weekly telephone contact with the subject, the APN completed a nursing intervention telephone data form for a total of 12 forms for each of the 44 subjects.	Data was analyzed and compiled as a log for each subject. The process of data reduction, data display, conclusion drawing and verification were grounded in the recommendations of Miles and Huberman (1994). Each log was analyzed to capture its essential feature. Data from each log was subsequently reduced by name and pattern and coded to identify preliminary themes and categories. As the categories became saturated, salient and common activities were identified.	Three APN's who provided coaching to a randomly assigned group of post-myocardial infarction unpartnered elders (n=44).	A synthesis of the data revealed 4 themes of activities used by the APN during the APN-coached intervention. Primary activities identified were patient education, validation/feedback, encouragement/support and problem solving. The actual interventions of the APN were theory driven and reflected practice that was grounded in the specialty of cardiovascular nursing. Enhancing the self-efficacy expectation for recovery behaviors was a significant part of the APN nursing activity. The amount of time invested in each case, including assessment, telephone intervention, calls to the healthcare team members, and documentation averaged 8 hours per subject.

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Author/ Article Title/ Year/ Country	Purpose/ Objectives	Design/Data Collection	Analysis	Participants: age/ gender/ groups	Outcomes/ Socio-Economic Indicators
Dansky KH, Bowles KH, Palmer L. how telehomecare affects patients. Caring magazine 1999; August:10-14. **USA**	Article discusses a joint project, where the purpose of the project is to test the effects of telemedicine on quality of care and financial costs associated with home health services.	Focus groups were used to collect data. The project team collects data from a number of sources. Focus groups and surveys were used.	Notes from the focus groups are coded and analyzed using qualitative analysis.	Patients were diabetics who were discharged from the hospital and referred to the Visiting Nurses Association of Greater Philadelphia. Patients were assigned to either a control group or an intervention group. A standardized diabetes clinical pathway was used for patients in both groups.	The project team expressed frustration with the number and complexity of technical problems with the telehomecare equipment. They reported that patients often experienced a similar frustration. Analysis of the focus groups also helped the project team identify important patient care issues. The nurses' comments are very personal and offer new insight into the nurse-patient relationship. This special relationship fosters patient empowerment.
Franken EA, Jr., Whitten P, Smith WL. Teleradiology services for a rural hospital: a case study. J Telemed Telecare 1996; 2(3):155-160. Arkansas, USA	To investigate the perceived quality of teleradiology services offered at a rural hospital in comparison with radiology provided by three other methods: 'circuit riding', an on-site radiologist, and a hybrid arrangement.	case study, interviews of administrators, technologists and physicians at the rural hospital, structured survey of all staff physicians. Interviews were focused but open-ended. A general interview guide was used by researchers. The interviews were conducted on site by the senior author and lasted 10-30 min.	analysed both qualitatively and quantitatively. The qualitative analysis involved the identification of categories of concern for further investigations.	Initials interviews included hospital administrator, the radiology chief technologist, the radiology clerk responsible for teleradiology and representative physicians.	Both interviews and the survey indicated that teleradiology was perceived to be as accurate as on-site film interpretation. All other aspects of the service--efficiency, reports, communications and the overall contribution to patient care--were judged to be poorer than on-site radiology

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Author/ Article Title/ Year/ Country	**Purpose/ Objectives**	**Design/Data Collection**	**Analysis**	**Participants: age/ gender/ groups**	**Outcomes/ Socio-Economic Indicators**
Gallienne RL, Moore SM, Brennan PF. Alzheimer's caregivers: psychosocial support via computer networks. Journal of Gerontological Nursing 1993; 19(12):15-22. **USA** Cleveland, Ohio	Article presents the creative use of support of caregivers (of Alzheimer's disease) via a computer network called Computerlink	Descriptive (VIII); Qualitative Three types of psychosocial support noted: instrumental support, emotional support, and spiritual support	none mentioned	47 caregivers had access to the Computerlink forum average age of caregivers was 60.3 years (range 19-83) n=32 female n=15 male mean length of caregiving relationship at beginning of project was 30 months	Nurses provide instrumental, emotional, and spiritual support to caregivers Exchanging messages helpful for caregivers

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APPENDIX Q: CRITIQUE QUALITATIVE

Author/ Article Title/ Year/ Country	Purpose/ Objectives	Design/Data Collection	Analysis	Participants: age/ gender/ groups	Outcomes/ Socio-Economic Indicators
Hanson EJ, Clarke A. the role of telematics in assisting family carers and frail older people at home. Health and Social Care in the Community 2000; 8(2):129-137. **UK**	To report on the first phase of evaluation conducted using a case-study approach to test the ACTION system (assisting carers using telematic interventions to meet older persons' needs).	Case-study approach. It was deemed to be the most appropriate given that the key aim was to gain detailed feedback regarding the ACTION system in order to improve the quality of the programs and to explore the utility and usability of the video-phone equipment. A conversational approach was used for the quality of life interviews. The aim of this approach is to allow people to speak freely	A broad thematic analysis was carried out according to the key areas of the interview guide, namely participants' individual caring situations and the anticipated impact of the action system. Every attempt was made to view each interview as a whole and to quote the participant's own words wherever possible in order to ensure that their experiences and views remained of central importance.	Initially, 12 family carers were approached to participate in the study. The inclusion criteria was that family carers and frail older people both had to be registered at the practice; the family carers had to care for a relative over the age of 65 years; persons with acute psychiatric illness were excluded, as well as those people deemed to be experiencing significant stress levels. n=3	Low response rate of carers willing to participate in the project. Several potential participants agreed with Joyce, who had said that they did not have sufficient time to devote to the project as their caring situation demanded most of their time. There were other carers who felt that they may not be able to use the technology, and also voiced concerns about having the equipment in their home. It is important that for ACTION to be beneficial, the carers must be identified earlier in their caring trajectory before a crisis situation occurs

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APPENDIX Q: CRITIQUE QUALITATIVE

Author/ Article Title/ Year/ Country	Purpose/ Objectives	Design/Data Collection	Analysis	Participants: age/ gender/ groups	Outcomes/ Socio-Economic Indicators
Magnusson L, Berthold H, Brito L, Chambers M, Daly T, Emery D. ACTION: assisting carers using telematics interventions to meet older person's needs. Nursing informatics: the impact of nursing knowledge on health care informatics. Proceedings of NI'97, Sixth Triennial International Congress of IMIA-NI, Nursing Informatics of International Medical Informatics Association. Amsterdam, Netherlands: IOS Press, 1997: 551. European project.	ACTION system is designed to maintain or enhance quality of life for older disabled and carers; enhance knowledge, skills and competence of family carers; meet carers need to improve emotional support; and provide carers with ability to develop enriching activities to improve the QOL of those cared for	Needs of family carers were assessed using focus groups with family and professional carers and 451 completed q'aires Project seeks to develop a prototype including equipment and Intranet system Software is being produced in areas such as caring in daily life, planning for respite and long term care, coping and emergency situations; and financial information	No description of analysis on q'aires or focus groups	Majority of carers female, older than 45 Cared people noted as being mostly women over 75 years of age	Anticipated carer benefits include: - Direct access to care info and practical advice which will improve the carers' competence and their ability to provide care - Opportunities for older people and their family carers to plan for long term care and acquire info about the local respite facilities available - Clarification so that family carers realize the financial benefits and econ support they can claim - Using social cognitive learning theory (Bandura, 1977) together with the work of Folkman and Lazarus (1980) an interactional coping model has been constructed with illustrates the interaction between the environment, the carers' cognitive appraisal and their subsequent physical and emotional behaviour

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Author/ Article Title/ Year/ Country	Purpose/ Objectives	Design/Data Collection	Analysis	Participants: age/ gender/ groups	Outcomes/ Socio-Economic Indicators
Monrad Aas IH. Changes in the job situation due to telemedicine. Journal of Telemedicine and Telecare 2002; 8:41-47. **NORWAY**	To investigate how telemedicine changes the job situation or about how the working environment might be improved for those involved in telemedicine.	Qualitative interviews The sample was obtained by contacting a local hospital where telemedicine was being done. The personnel involved in telemedical work gave the details of persons and organizations with whom they used telemedicine and bout others working with telemedicine. These people then were contacted. This process continued until the sample had been obtained. Data was collected from September 1998 to April 1999.	The interviews were taped-record and then transcribed. Scrutiny showed that 960 elements of information were sufficiently interesting to warrant further study. The information as coded and transferred to a statistical package. For this paper, 119 of the 960 variables were analyzed.	n=30 32 people were identified, but two contacted refused to be interviewed due to lack of time.	63% of the sample said that telemedicine produced changes in the job situation, mostly that the technology reduced travelling. 87% of the sample felt that the telemedicine equipment was easily available, located at their workplace. In Telepsychiatry, the results show that the technology has a role to play beyond remote consultations with the patient present. Telemedicine may reduce the need for travelling both to see patients and to attend administrative meetings. This factor should be taken into consideration in health economic analysis. The most frequently mentioned change was that of less travelling. In that, more time can be spent on other activities and productivity can improve. No one reported health problems related to telemedical work. Several respondents mentioned the role of technology in cooperation. For some, the technology made it possible to participate in daily and weekly meetings, and they made new contacts.

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APPENDIX Q: CRITIQUE QUALITATIVE

Author/ Article Title/ Year/ Country	**Purpose/ Objectives**	**Design/Data Collection**	**Analysis**	**Participants: age/ gender/ groups**	**Outcomes/ Socio-Economic Indicators**
Tually P, Walker J, Cowell S. The effect of nuclear medicine telediagnosis on diagnostic pathways and management in rural and remote regions of Western Australia. J Telemed Telecare 2001; 7 Suppl 2:50-53. Western Australia, Australia	to describe the effect of nuclear medicine telediagnosis (NMT) on referral patterns and delivery of care.	The design adopted both a quantitative and qualitative approach, based on case study analysis. The data source encompassed the entire primary-care referral base and relevant specialists.	Case study analysis.	209 medical practitioners in remote and rural areas of the state	Substantial increase in proportion of practitioners complying with Clinical Practice guideline recommendations for musculoskeletal and oncology cases, in comparison with pre NMT and with non-NMT regions. NMT input led to the detection of disease and a change to therapeutic management in 122 cases and eliminated the need to transfer patients to another facility for unnecessary and expensive examinations in 38

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APPENDIX Q: CRITIQUE QUALITATIVE

Author/ Article Title/ Year/ Country	Purpose/ Objectives	Design/Data Collection	Analysis	Participants: age/ gender/ groups	Outcomes/ Socio-Economic Indicators
Whitten P, Kingsley C, Cook D, Swirczynski D, Doolittle G. school-based telehealth: an empirical analysis of teacher, nurse, and administrator perceptions. Journal of School Health 2001; 71(5):173-179. **USA**	Discusses the attitudes and opinions of key players; teachers, nurses and administrators involved in providing the service.	Qualitative study; archival data was used, as well as interviews with the key players on the project from the United School District 500 (USD 500) and KUMC (Kansas University Medical Centre). There were three different kinds of data collection strategies employed. 1) the teachers from each of the six new schools were randomly selected for an in-depth interview. Teachers were randomly selected from each middle school. The resulting interviews were transcribed verbatim and content analyzed. 2) Researchers conducted two focus groups with the nurses from all participating schools. 3) 8 key administrative staff at KUMC and USD 500 were interviewed. These were transcribed verbatim and content analyzed. Remarks from administrators at KUMC and USD 500 were compared to discern attitudinal difference.	Analysis	From November 1998 to May 1999, three elementary schools, two middle schools and a high school were added into the project. 371 consults were performed.	Three major response categories emerged from this open-ended question: 44% reported they made the decision by observing physical symptoms, 34% by observing physical symptoms as well as the student telling him/her, and 20% indicated the student told the teacher directly. During the initial focus group, the nurses raised objections that reflected their frustrations with the status quo. A level of apprehension surrounded interaction with an unknown physician and expectations to promote the program to parents. During the second focus group, all the previous perceptions had changed. Rather than perceiving the new responsibility as a burden, they saw it as enhancing the nursing skills, as appreciation, greater interaction with physicians. The administrators thought that it gave communication with the community, good public relations. However, the drawbacks were that there was no medicaid billing system in place, and insufficient planning and bureaucratic hold-ups resulted in a longer start-up time than was expected.

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APPENDIX Q: CRITIQUE QUALITATIVE

Author/ Article Title/ Year/ Country	Purpose/ Objectives	Design/Data Collection	Analysis	Participants: age/ gender/ groups	Outcomes/ Socio-Economic Indicators
Whitten P, Mair F, Collins B. home telenursing in Kansas: patients' perceptions of uses and benefits. Journal of telemedicine and telecare 1997; 3(1);67-69. **USA**	To examine a telenursing home health service for the elderly in Kansas and explore patient perceptions. There were three main areas studied. 1) patients' feelings about this mode of health-care delivery and the technology used 2) patients' views of the implications of telenursing for their health care 3) patient's perceptions of communication issues.	Qualitative interviews. Telephone interviews were performed using a 17-item, open-ended interview guide, developed by the researchers. Phase 1 occurred after a patient had received a minimum of 5 telenursing visits and phase 2 occurred after a further three months had elapsed. All interviews were recorded and subsequently transcribed for data analysis.	Data was analyzed using thematic content analytic procedures for each of the three research questions to determine the content and frequencies of the patient perceptions toward tele-home health services.	Phase 1, n=22 (n=4 men and n=18 women). Phase 2, n=9 (n=1 man and n=8 women). Study individuals were individuals involved in an ongoing home telenursing project. Inclusion criteria was patient under physician care, residence in the appropriate geographic service area, met a medical needs test, and provided inform consent. Exclusion criteria included a terminal condition, necessity for daily invasive procedures or an inability to follow simple instructions.	Variety of expectations in phase 1, such as excitement, curiosity, nervousness, altruism and nonchalance. During phase two, the patients claimed that this service was of no benefit to them. In phase 1, patients spoke of telenursing in three different ways (as a security tool, as a project that offered no benefits to them, and as tool to address a specific medical condition). In phase two, perceptions changed. 25% felt that it was a security tool, 50% felt that it offered them no benefits at all, and 13% felt that it acted as a tool to address a specific medical condition. In both phases, participants reported there were no topics they felt uncomfortable talking about over the system and they perceived no differences in the content of their conversations based on whether the nursing visit was in person or over the telenursing system.

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APPENDIX Q: CRITIQUE QUALITATIVE

Methodology (Reliability and Validity): Ethics	**Policy Recommendations**	**Applicability to Alberta**
Addresses the idea of reflexivity while reading the data. Before they analyzed the data, they noted their own bias and preconceptions toward telemedicine, so they could consciously avoid them while reviewing the data.	Those introducing telemedicine to these areas appear most likely to succeed if they begin with an understanding of how the technology is perceived by rural providers. There are three "types" of categories according to readiness for implanting telemedicine. For those in the "fertile soil", it is important to include the physician and administrators in the entire planning and implementation process. Empowerment is also a key. For the category of "partly fertile soil", it is important to establish a sense of urgency for implementing the new technology. "Barren Soil" need implementation strategies that need to be tailored to the environmental conditions of practice sites.	

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APPENDIX Q: CRITIQUE QUALITATIVE

Methodology (Reliability and Validity): Ethics	**Policy Recommendations**	**Applicability to Alberta**
Validity or credibility of the findings was established through a variety of methods. An extensive audit trail articulated all design decisions and interpretation. Conclusions drawn throughout the analysis were verified by reviewing the logs and conferring with experts on the research team. All interpretations were examined for plausibility, coherence, and replication with other data sources as well as from narratives written by nurse interventionists.	With this vulnerable group of unpartnered elders, there are a number of implications for nursing practice. These include earlier follow-up with the healthcare provider and more in-home monitoring. Referral to cardiac rehabilitation programs should also be emphasized as these program offer not only nursing and medical surveillance but also provide an important social support mechanism.	

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Methodology (Reliability and Validity): Ethics	Policy Recommendations	Applicability to Alberta
Strategic planning includes the development of clearly stated goals and objectives. Evaluation of the project requires collecting relevant data, both during the project and after its completion to determine if goals and objectives have been met.	Further research is needed on the content of video visits and an analysis of patterns of use to determine the types of patients and nurses who respond well to telehomecare.	
The use of more than one method, as is done in this study, serves as a test of validity and contributes to a more complex picture of the organization. To ensure privacy, individual comments were not attributed to particular participants.	provision of acceptable teleradiology requires considerable attention to all aspects of the radiology service, with attention to differences in institutional culture and mission, and to communication.	Need to consider broadly the aspects of service provision is applicable

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Methodology (Reliability and Validity): Ethics	Policy Recommendations	Applicability to Alberta
none mentioned	Advantages of the provision of psychosocial support via this medium are: -social interaction among members permits options to be defined and opinions to be shared -anonymity -24-hour access to ComputerLink -messages of emotional and spiritual support and vital information are saved on the network and can be easily retrieved The support provided to caregivers through this network is very important considering that empathetic communication of this nature cannot happen in an office setting.	

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APPENDIX Q: CRITIQUE QUALITATIVE

Methodology (Reliability and Validity): Ethics	**Policy Recommendations**	**Applicability to Alberta**
Local ethical approval was gained in order to recruit participants. Research methodology is a good match for the research question.	The use of such technology can facilitate the process of empowerment of older people and their family carers, yet it cannot change the shape of current service provision. There is a wider problem to be considered, that is, even if a service is theoretically available, there is no guarantee that a carer can access it. It must be acknowledged that a system like the ACTION system can not solve the wider problems of current service provision with regard to lack of resources. The bottom line is that the use of such technology with individual family carers and older people, in close collaboration with their key health and social care providers, is the key in order to ensure that the positive aspects of the technology are fully realized and the negative aspects are kept to a minimum.	

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APPENDIX Q: CRITIQUE QUALITATIVE

Methodology (Reliability and Validity): Ethics	Policy Recommendations	Applicability to Alberta
Article discusses future project activity that will concentrate on the validation of the ACTION system. The entire ACTION products and services will be tested and evaluated in 40 private homes, nursing and residential home, hospitals and health care centres.	By development and implementation of info and communication technology confidence and competence in the family care setting can increase and nursing and social service support work can be further developed Can increase the quality of life for disabled and elderly and their family carers	

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Methodology (Reliability and Validity): Ethics	**Policy Recommendations**	**Applicability to Alberta**
At the time of data collection, the sample represented much of the telemedical activity in Norway in the disciplines studied. After having done 10-12 interviews, little new information was obtained by conducting more (theoretical saturation). As sampling continued up to 30 this adds to the external validity of the findings. Transferability of the findings to other settings may depend on similarity of context.	More frequent cooperation and more employees participating within a cooperative network is likely to improve the quality of care, as delivery of health-care by teams has been reported to be of higher quality than that provided by a single professional. Telemedicine can have a negative influence in the work situation; for example, it can be tiring and stressful. It is possible to overcome this by limiting the volume of telemedicine per employee. Control of the work situation may be greater in a more decentralized organization by decreasing the separation of management from where the core production takes place.	

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APPENDIX Q: CRITIQUE QUALITATIVE

Methodology (Reliability and Validity): Ethics	Policy Recommendations	Applicability to Alberta
Only sparse details presented, none for non –NMT centres. While reference to costs is made in the conclusions, no cost data are presented.	"While NMT is more costly than conventional nuclear medicine services, it permits faster access to specialist consultation, provides for better management and is likely to reduce overall health costs by reducing the volume of inappropriate tests and treatment practice"	In principle, as needed

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Methodology (Reliability and Validity): Ethics	**Policy Recommendations**	**Applicability to Alberta**
not mentioned	Reimbursement represents a major issue that must be resolved relative to telehealth in schools. Providing health care service free of charge is not possible or sustainable for long periods of time in most situations. A reimbursement model for telehealth in schools must be explored, tested and ultimately implemented.	

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Methodology (Reliability and Validity): Ethics	**Policy Recommendations**	**Applicability to Alberta**
Participants had to provide their informed consent. No discussion of reliability or validity.	Further thought needs to be given to defining clearly the purpose and goals of telemedicine projects. Research projects which measure technical feasibility should be distinct from those which purport to provide a service.	

Note: Abbreviations used in this document are described in Appendix D

APPENDIX R

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